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LEADERSHIP DEVELOPMENT IN EDUCATION FOR SUSTAINABLE DEVELOPMENT: EVALUATION OF HIGHER EDUCATION STUDENTS IN SUSTAINABLE DEVELOPMENT PROGRAMS

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LEADERSHIP DEVELOPMENT IN EDUCATION FOR SUSTAINABLE DEVELOPMENT: EVALUATION OF HIGHER EDUCATION STUDENTS IN SUSTAINABLE DEVELOPMENT PROGRAMS

by

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STATEMENT OF DISSERTATION APPROVAL

The dissertation of **Michelle Dzurenda**

has been approved by the following supervisory committee members:

Dr. Anthony Setari	, Chair	**April 14, 2022** Date Approved
Dr. Pamela Martin	, Member	**April 14, 2022** Date Approved
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Abstract

The United Nations Department of Economic and Social Affairs (UN DESA) has been working decades towards reaching Sustainable Development Goals (SDGs) to create peace and prosperity for people and the planet. The 2030 Agenda was created as an urgent call to action, a global partnership, and a comprehensive plan to work towards the 17 SDGs. For this study, the focus is on Goal 4- quality education and the impact of leadership on Education for Sustainable Development (ESD). Leadership on ESD has been a more recent topic and under researched. By making advancements in leadership on ESD there will be positive global impacts on the urgent need to achieve all 17 goals by 2030. Higher Education Institutions (HEIs) have been implementing ESD programs in effort towards achieving SDG goals. The purpose of this mixed methods integrated analysis is to evaluate the leadership development of 40 higher education students across four different ESD programs at Coastal Carolina University. Leadership development is investigated through multiple measures, involving a critical analysis of formal and informal learning experiences. The case study evaluation is significant and demonstrates overall growth in leadership as a result of participating in the sustainability programs. In addition, the findings provide a holistic view of the growth that occurred throughout the semester. By understanding that both leadership and learning is transformational, we can further our research and better understand the impact of leadership on ESD, which is necessary to create a more sustainable future.

Keywords: Leadership, Sustainability, Education, Sustainable Development Goals (SDG), Education for Sustainable Development (ESD), Transformational Leadership, Higher Education Institutions (HEI).

Dedication

The dedication of my dissertation and degree extends to every person who has contributed to my journey, in all capacities, while on the road the Dr. Dzurenda. To my family, friends, colleagues, teachers, coaches, students, and athletes, my hope is that I have added equal value to your lives. I dedicate myself to being a continuous learner, transformational leader, and to inspire others to do the same. Effective leaders create leaders, and together we will form a collective impact that will allow us to do more, serve more, be more, and ultimately make our world a better place. The completion of this degree is not the end, but rather the beginning. As a leader I know that I have never arrived. As I continue on this lifelong journey to reach my full potential, I can only hope that it will influence others to do the same. I dedicate this to the youth leaders of our world in our current and future generations to come. I dedicate this to my future husband, children, and students who I have not yet met. Lastly, this achievement is not about receiving a new title, but about growing into that new level. More importantly, this Ph.D. is about the person and leader I have become along the way and has prepared me for a lifetime of impact that I hope I will have on all of you. Thank you.

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Chapter 1: Introduction

According to the United Nations Educational Scientific and Cultural Organization (UNESCO) (2021) Education for Sustainable Development (ESD) empowers learners of all ages with the knowledge, skills, values, and attitudes to address the interconnected global challenges we are facing, including climate change, environmental degradation, loss of biodiversity, poverty, and inequality. UNESCO (2021) provides global and regional leadership in education, strengthens education systems worldwide and responds to contemporary global challenges through education with gender equality as an underlying principle. Its work encompasses educational development from pre-school to higher education and beyond. "UNESCO believes that education is a human right for all throughout life and that access must be matched by quality" (UNESCO 2021). The organization is the only United Nations agency with a mandate to cover all aspects of education. It has been entrusted to lead the Global Education 2030 Agenda through Sustainable Development Goal 4-Quality Education. The roadmap to achieve this is the Education 2030 Framework for Action (FFA)" (UNESCO, 2021). Goal 4 is one of the 17 UN Sustainable Development Goals (SDGs). By making advancements in leadership in ESD and Goal 4, it will have positive global impacts on the urgent need to achieve all 17 goals by 2030. "Education should be transformative and allow us to make informed decisions and take individual and collective action to change our societies and care for the planet" (UNESCO, 2021). The purpose of this case study is to evaluate the leadership development of higher education students involved in ESD programs. By critically examining the leadership growth and development of higher education students participating in different formal and informal ESD

learning experiences, we can better understand the role of leadership on ESD which is necessary to create a more sustainable future.

Learning must prepare students and learners of all ages to find solutions for the challenges of today and the future. “Higher education can create the attitudes, changes, and leadership necessary for the transformation of societies, since successful global leaders come from higher education backgrounds in every region of the world” (Price et. al, 2021). “UNESCO supports ESD which is designed for young people aged 18-35 who are active leaders in sustainable development in their communities and regions. UNESCO believes that ESD should contribute to building young people’s capacity as ESD leaders in their communities and in their regions by focusing on two main objectives” (UNESCO, 2017):

1. Empower youth leaders to inspire and mobilize others to take action towards building more sustainable, just, and resilient communities.
2. Build a youth led ESD network for exchange and collaboration

Higher Education Institutions (HEI) all over the world are implementing education for sustainable development programs. HEIs are seeing the value and importance of education for sustainable development in recent years. There has been a significant increase of the implementation of these youth development programs in HEIs over the last decade. Recent research in ESD programs at Higher Education Institutions (HEI) have shown that leadership practices and activities have significant impacts on the success of change (Novawan & Aisyiyah, 2020). “Leadership reflects the characteristics of the transformational leadership style. The effects of this kind of leadership coupled with coordination and participation of all concerned would potentially lead to improvement in economic efficiency, social cohesion,

and environmental responsibility. These are the three basic indicators of sustainable development" (IISD, 2018).

Background of SDGs

The United Nations Department of Economic and Social Affairs (UN DESA) has been working decades towards reaching Sustainable Development Goals (SDGs) to create peace and prosperity for people and the planet, now and in the future. During the United Nations Conference on Sustainable Development in Rio de Janeiro, Brazil in June 2012, a three-year process began to develop the set of SDGs (UNESCO, 2017). In 2013, The General Assembly set up a 30-member open working group to develop a proposal on the SDGs. In 2015, the 2030 Agenda was developed and adopted by all Member States of the United Nations. The 2030 Agenda is an urgent call to action, and a global partnership and a comprehensive plan to work towards the 17 SDGs in developed and developing countries (United Nations, 2021). The 17 goals recognize that ending poverty and other deprivations must go hand-in-hand with strategies to improve health and education, reduce inequality, and spur economic growth. Within the 17 SDGs, there are 169 unique targets and 232 individual indicators. The Global Indicator Framework for SDGs was developed by the Inter-Agency and Expert Group on SDG Indicators (IAEG-SDGs) and agreed upon at the 48th session of the United Nations Statistical Commission held in March 2017. This was later adopted by the General Assembly on July 6th, 2017 (United Nations, 2022). "This framework is contained in the Resolution adopted by the General Assembly on Work of the Statistical Commission pertaining to the 2030 Agenda for Sustainable Development (A/RES/71/313), Annex. According to the Resolution, the indicator framework will be refined annually and reviewed comprehensively by the Statistical Commission at its fifty-

sixth session, to be held in 2025. The global indicator framework will be complemented by indicators at the regional and national levels, which will be developed by Member States" (United Nations, 2022). Annual Refinements of Indicators are included in the indicator framework as they occur. This initiative is carried out all while tackling climate change and working to preserve our oceans and forests (United Nations, 2022). Each of the 17 SDGs are highlighted in the Figure 1 below:

Figure 1

The 17 Sustainable Development Goals

Note. The 17 SDGs developed in 2015 are a blueprint to achieve a better and more sustainable future for all people and the world by 2030. Found (Copyright © United Nations, 2022). http://sdgs.un.org/goals

ESD related directly to Goal 4.7, which targets Sustainable Development Goals on Education and is thought to be at the core of the SDGs to help achieve all 17 goals. Since the 2030 Agenda was created in 2015, there have been many developments to advance SDG 4-Quality Education. Education is the top priority because it is a basic human right and the foundation on which to build peace and drive sustainable development (UNESCO, 2017). UNESCO, being a specialized agency for education, was assigned to help lead and coordinate the education goals to reach the 2030 Agenda. "The implementation of Education for Sustainable Development is a key enabler for achieving the other SDGs" (UNESCO, 2020). According to UNESCO (2020), the best practices developed and applied worldwide to reach this global framework include:

1. Pedagogy and learning environment
2. Learning content
3. Learning outcomes
4. Societal transformation

Pedagogy and the learning environment employ interactive, project-based, and learner-centered instructional strategies. This transforms all aspects of the learning environment through a whole-institution approach to ESD, to enable learners to live what they learn and learn what they live. The learning content integrates sustainability issues and includes the 17 SDGs into all types of learning. "ESD is a lifelong learning process and an integral part of quality education that enhances cognitive, social and emotional, and behavioral dimensions of learning. It is holistic and transformational and encompasses learning content and outcomes, pedagogy, and the learning environment itself" (UNESCO, 2020). Overall, the

implementation of ESD aims to create a societal transformation and enable the achievement of the SDGs towards building a more sustainable world.

Statement of the Problem

With the fast rate of new ESD programs emerging, there have been multifaceted challenges encountered by educational institutions worldwide, especially in their efforts to develop curriculum and pedagogy that are engaging for ESD (Novawan, 2020). Research is still recent on the new implementations of ESD programs, and best practices are in the process of being identified and developed. "Although a number of universities have employed effective pedagogies for ESD, and several have defined sustainability-related educational outcomes for their programs, little work has been done to evaluate university offerings in sustainability education, such that their quality, curricular content, and effectiveness are largely unknown" (Kioupi & Voulvoulis, 2020). One of the other challenges is the scarcity of strong leadership in curriculum reform. Within the notion of ESD, sustainable curriculum, including its pedagogical practices, would benefit greatly by changing dynamically to accommodate present needs and to anticipate future demands. ESD curriculum and pedagogy require strong, dynamic, and sensitive leadership, not only to understand what is currently happening, but to anticipate what will happen in the future. UNESCO (2020) explains that ESD has been mostly associated with scientific knowledge on the environment, but that is not enough to bring the transformative power of education to full force.

Research on ESD to achieving Goal-4 is relatively new, therefore leadership on ESD is an even more recent topic studied by researchers. It is understood that developing leaders in sustainability practices would advance the efforts at reaching the 2030 goals, however

understanding in depth which specific skills and competencies are needed to move sustainable communities forward is still not fully understood. “In this context, skills that sustainability-literate individuals or leaders in the field of sustainable development should possess have been discussed as well as the best pedagogical methods for conveying these skills” (Missimer & Connell, 2012). Leadership in sustainability is not only important in education and achieving Goal 4, but it should be implemented across all fields and is crucial for achieving all 17 SDG goals. The United Nations Global Compact (2018) has a blueprint for business leadership on the SDGs. “The Blueprint for Business Leadership on the SDGs aims to inspire all business regardless of size, sector, or geography to take leading action in support of the achievement of the SDGs” (The United Nations Global Compact, 2018). Business leadership on SDGs evolves through repeating three steps; prioritize, act, and learn. Leaders in business should first prioritize their efforts to align with the SDGs. After the priorities are set, the second step in leading a company takes time and context. The United Nations Global Compact (2018) describes specific action that embodies five, equally important, leadership qualities, including:

1. Intentional
2. Ambitious
3. Consistent
4. Collaborative
5. Accountable.

The final step is to learn. A leader commits to learning about the impacts of their actions on the SDGs, sharing lessons both internally and externally. “Leadership evolves by taking action on the SDGs that are closely interconnected to the company’s entry points and then

over time, expands beyond these. Ultimately, the interconnectedness of the SDGs means that the leading company must adapt its business in all areas where it influences the 2030 Agenda" (United Nations Global Compact, 2018).

Higher Education Institutions are run as businesses, and their leaders need to continue to look at the institution holistically, considering all elements in order to have a societal transformation. "To shift to a sustainable future, we need to rethink what, where and how we learn to develop the knowledge, skills, values and attitudes that enable us all to make informed decisions and take individual and collective action on local, national and global urgencies" (UNESCO, 2020). As described by Fu et. al (2019), achieving these goals will rely more on institutional changes, which will necessitate inputs from both the social science and ethics domains. Not all institutions have the resources needed to be able to implement these types of programs. Institutions may have the financial resources needed; however, they may not yet understand the best practices to use to implement an effective program. "HEIs are challenged by the growing worldwide trends including the high level of competition, the decrease in government funding and sources, the greater scrutiny, the emphasis on student-rights, and the rapid spread on Information Communication Technology" (Novawan, 2020).

The other challenge is remembering how all 17 SDGs play a role and impact one another. Improvements in education, health, and social equality (i.e., expected objectives), however, can only be achieved through institutional change, which is strongly influenced by the social sciences. All the goals are multi-faceted and include meeting the needs of local enterprises and community residents (Fu et. al., 2019). Although the number of universities affiliated with a sustainable development organization have been increasing, ESD is not implemented into every HEI around the world. **"**In collaboration with UNESCO, the IAU

World Higher Education Database, (WHED) Portal provides authoritative information on higher education systems, credentials in 196 countries and territories and over 20,000 officially accredited or recognized HEIs" (IAU, 2022). "Of the almost 20,000 HEIs worldwide, according to the International Association of Universities World Higher Education Database, 346 and 532 submitted data about their SDGs performance in 2019 and 2020. Note that the universities reporting to Times Higher Education (THE) do not necessarily send information about all the SDGs. Consequently, the number of observations in certain SDG rankings lowered respectively" (De la Poza et. al., 2021). Another issue is the inaccuracy of data being reported. Although the higher education community has shown significant enthusiasm for the SDGs, only a small number of institutions are currently reporting on their contributions to the SDGs. According to the International Institution for Sustainable Development (IISD) (2020), the inaccuracy may be due to the following:

- Universities working on the SDGs are not reporting
- Universities are inaccurately reporting what they are actually doing
- Universities are lacking knowledge in sustainability and may be working towards SDGs without realizing they are
- Universities are working with outside organizations, or have their own measurements or reporting systems

The lack of context in the few SDG reports by HEIs that do exist makes it difficult for stakeholders to draw meaning from these reports. Ultimately, if higher education SDG reporting is to be more than a public relations exercise, and if it is to advance the sector as a whole, it will need to be supported by an accessible tool with standardized indicators and a

centralized reporting platform to facilitate data analysis (Kistner, Dautremont, & Urbanski, 2020).

Purpose of the Study

The purpose of this study is to evaluate leadership development of higher education students involved in sustainability programs. The unit of analysis are four different organizations at Coastal Carolina University (CCU) that involve higher education students in sustainability. Although each group structures their programs differently, all participants engage in formal or informal learning and participate in experiential learning activities that prepare students to become sustainability leaders in the 21st century. Additionally, the four groups target youth development in higher education for sustainable development and align their actions with the 17 SDGs. The four groups of participants that will be evaluated are the following:

1. RCE Georgetown
2. Solar Ambassadors
3. Sustain Coastal- Eco-Reps
4. Sustain Coastal- Green Team

Georgetown RISE is considered a Regional Centre of Expertise (RCEs) which in higher education are multi stakeholder networks to engage sustainable development. Some RCEs (but not all) use experiential learning activities to prepare students to become sustainability leaders. From the four programs being evaluated, RCE Georgetown is the only group that is associated as an RCE. The investigation evaluates the leadership development of higher education students in all four groups throughout the Spring 2022 semester. In general, sustainable development programs in higher education are important because they target

youth development in sustainability and educate large numbers of students around the world. Youth leaders working towards the SDGs are a clear example of how young people are leading the way in shaping a more sustainable and inclusive future for all. The analysis of data in chapter four illustrates the connection between Education, Scientific, and Cultural Organization (UNESCO) ESD Learning Objectives, and best practices used from higher education programs. UNESCO (2017) explains that ESD learning objectives are inherent in the concept of lifelong learning. "All educational institutions from preschool to tertiary education and in non-formal and informal education can and should consider it their responsibility to deal intensively with matters of sustainable development and to foster the development of sustainability competencies. ESD provides an education that matters and is truly relevant to every learner in the light of today's challenges" (UNESCO, 2017).

The current study is an illustration of higher education sustainability programs that implement leadership development. The four programs that are primarily investigated in this report all contribute to the leadership development of the higher education students. The report analyzes students throughout the semester in several ways, including formal sustainability courses, as well as action-oriented learning experiences such as internships, campus, and community involvement. UNESCO (2017) describes action-oriented learning, as learning that occurs through action and reflection of experiences in terms of the intended learning process and personal development. "The experience might come from a project (in-service learning), an internship, the facilitation of a workshop, the implementation of a campaign, etc." (UNESCO, 2017). The current study demonstrates a deep reflection of learning in sustainability literacy, leadership trait and skill development, and the participants' overall leadership development in relation to the SDGs. While SDGs inspire

more integral actions across diverse and interconnected aspects of development, an ESD approach enables collective efforts to become more transformative (The United Nations University, 2018). “Transformative learning can best be defined by its aims and principles, rather than by any concrete teaching or learning strategy. It aims at empowering learners to question and change the ways they see and think about the world in order to deepen their understanding of it” (UNESCO, 2017). The intent of this study is to evaluate the leadership growth and development of higher education students involved in the sustainability programs throughout the semester. The findings of the case study analysis will be able to answer the following research questions:

1. Which of the leadership traits did the students develop throughout the semester?
2. Which of the leadership skills did the students develop throughout the semester?
3. Was there growth in sustainability literacy from the beginning to the end of the semester?
4. Was there overall growth in leadership development from the beginning to the end of the semester?

Coastal Carolina University

Coastal Carolina University is a dynamic public institution, located in Conway, SC which is considered the Myrtle Beach metropolitan area. In 1954, Coastal Carolina first opened as a junior college and was a branch of the College of Charleston. In 1993, CCU became an independent, public institution (Coastal Carolina University, 2021). CCU is accredited by the Southern Association of Colleges and Schools Commission on Colleges (SACSCOC) to award the baccalaureate, master's, specialist, and doctoral degrees. CCU has

an acceptance rate of 70.4% and enrollment of 10,118 students: 9500 undergraduates and 618 graduate students.

The President's Council for Sustainability and Coastal Resilience (PCSCR) was established in 2021. "PCSCR is committed to transforming CCU into a sustainable campus, centering sustainability in our curriculum and student services, and serving the surrounding communities as we endeavor towards a sustainable future" (Coastal Carolina University, 2022a). The PCSCR is committed to continue working to:

- Complete a comprehensive and inclusive campus greenhouse gas inventory
- Submit the University's second report via the Association for the Advancement of Sustainability in Higher Education's (AASHE) Sustainability Tracking, Assessment & Rating System (STARS)
- Establish formal, collaborative connections to the Access, Inclusion, and Diversity Council, and the Wellness Coalition
- Create and publish a sustainability and coastal resilience strategic plan for the University

CCU is committed to advancing sustainability-related initiatives and expanding learning opportunities for both students and campus and community stakeholders. Through the PCSCR and these Sustainability Grants, CCU is committed to increasing collaboration and advancing the SDGs. CCU is now affiliated with The Association for the Advancement of Sustainability in Higher Education (AASHE). "AASHE asserts that by training and educating future leaders, scholars, workers, and professionals, higher education institutions are uniquely positioned to help our community and the world. Through course development, research, and co-curricular programming, Coastal Carolina University can develop new

technologies, strategies, and approaches to address this interdisciplinary challenge. Institutions that offer multiple opportunities to address sustainability-related issues will help students engage with some of the world's most pressing global issues and lead society to a sustainable future" (Coastal Carolina University, 2022a). The PCSCR council includes members comprised of faculty, staff, and students. "The goal of the council is to be transformative, deeply embedding principles of sustainability into campus culture, ethos, curriculum, and community engagement toward making CCU a model for Sustainability and Coastal Resilience in higher education and beyond" (Coastal Carolina University, 2022a). In addition, the advisory group advises the President and senior administrators on all campus sustainability issues and works collaboratively to measure and review progress towards transforming Coastal Carolina University into a more sustainable university. Now that the university is affiliated with AASHE, the university uses the AASHE Sustainability Tracking, Assessment, and Rating System (STARS) which is a transparent, self-reporting framework for colleges and universities to measure their sustainability performance. Coastal Carolina University just received its first STARS Report in (2022) and scored a rating of silver with a score of 58.96. AASHE (2019) explains that an institution's score is based on the percentage of points it earns by pursuing relevant credits across the following:

- Academics (AC)
- Engagement (EN)
- Operations (OP)
- Planning & Administration (PA)

"Credits that are not applicable to an institution do not count against its score. An institution may also earn Innovation & Leadership (IN) points for exemplary and path-breaking

initiatives. These bonus points are added to an institution's percentage-based score to generate its final overall score. This optional section provides an opportunity for an institution to highlight up to three programs, initiatives, or accomplishments that best reflect its leadership for sustainability" (AASHE, 2019). This leadership section in the STARS Report not only allows for universities to have an "option" to participate in leadership initiatives for sustainability, but the leadership that it does focus on is only measuring the university's growth, and not the students' growth. Measurement across the students' growth and development as leaders in sustainability is also needed to be able to have the most effective impact on our planet.

History of ESD

ESD began over a decade before the 2030 agenda, and its significance is widely recognized. In 2002, an important international process culminated in the decision of the 57th Session of the United Nations General Assembly to adopt a resolution to launch the UN Decade of Education for Sustainable Development (DESD). In 2003, in response to the UN (DESD), the United Nations University Institute for the Advanced Study of Sustainability (UNU-IAS) launched the ESD project, with funding support from the Ministry of the Environment, Japan (UNU-IAS, 2010). UNESCO developed a Global Action Plan (GAP) on Education for Sustainable Development. "The GAP focuses on five priority action areas which cover all levels and types of education. Curriculum change should be further advanced to involve more ESD-relevant content, learning objectives, and learning practices" (UNESCO, 2017). "This GAP levels up all areas of education and learning, while respecting our planet's resources and enhancing our well-being. This program was built upon the original sustainable development initiatives from the UN DESD" (UNESCO, 2014). This

plan continues to accelerate progress towards achieving the SDGs (UNESCO, 2017). The implementation of the GAP included a wide range of stakeholders at the national, sub-national, and local level. A reporting mechanism was proposed in response to the need for evidence-based monitoring including targets and benchmarks. The development of such evaluation mechanisms would be regularly monitored, evaluated, and modified when needed (UNESCO, 2017). The GAP had a two-fold approach to accelerate progress towards the ESD action plan, and include two objectives:

Objective 1: To reorient education and learning so everyone has the opportunity to acquire the knowledge, skills, values, and attitudes that empower them to contribute to sustainable development.

Objective 2: To strengthen education and learning in all agendas, programs and activities that promote sustainable development.

To enable strategic focus and foster stakeholder commitment, the GAP has identified five priority action areas to advance the ESD Agenda for 2030 (UNESCO, 2017). The five priority action areas will enable ESDs to serve as a key role for the successful achievement of the 17 SDGs and the great individual and societal transformation required to address urgent sustainability challenges. The five priority action areas include:

1. Advancing policy by mainstreaming ESD
2. Transforming learning and training environments using the whole-institution approach
3. Building capacities of educators and trainers
4. Accelerating local level actions

5. Empowering and mobilizing youth, and finally accelerating sustainable solutions at the local level

"While implementing activities for the priority action areas, Member States are invited to mobilize the concerned stakeholders working in the five areas and support their collaborative networking under a coordinated strategy, related to the national framework on the SDGs. There shall also be more concrete efforts to develop communication and advocacy actions to reflect the SDGs in educational practices and frameworks" (UNESCO, 2017).

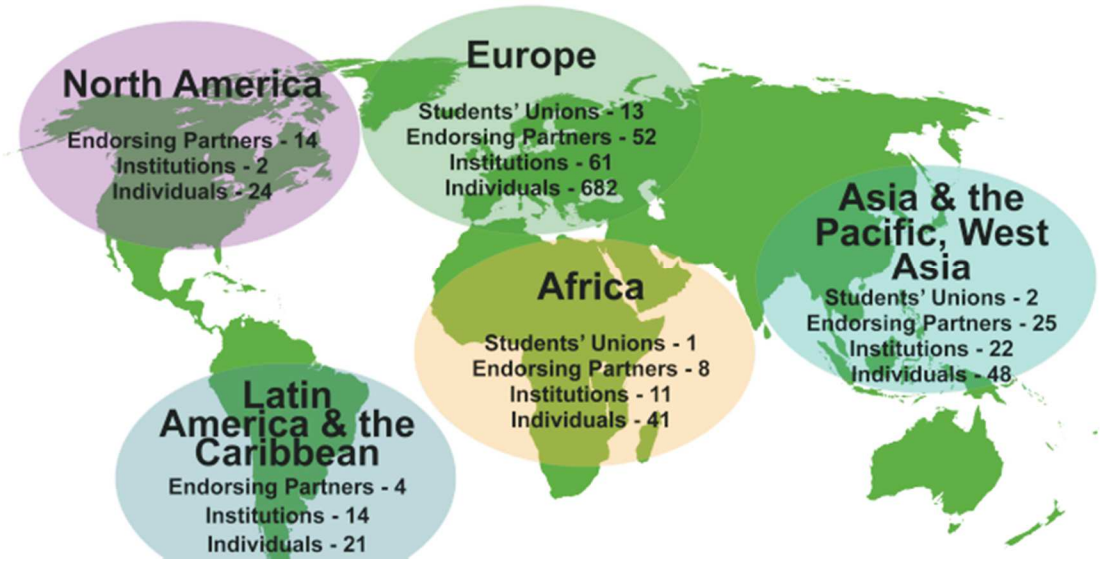
After the DESD ended in 2014, the GAP continued to be used as the framework from (2015-2019). In 2017, The Global Alliance Partnership Initiative, endorsed by the UN's Higher Education Sustainability Initiative (HESI) and many other global partners continued to expand, and has become more popular in colleges and universities all over the world. Through the Global Alliance Partnership Initiative, the creation of an international initiative called The SDG Accord was formed. The SDG Accord initiative was first born through members of the Alliance for Sustainability Leadership in Education (EAUC) Conference in Lancaster, 2017. "It is a great example of the power EAUC membership has on the global stage and has met with huge support from worldwide sustainability networks. Iain Patton, CEO of the EAUC, launched the Sustainable Development Goals (SDG) Accord in Vancouver, Canada in 2017" (EAUC, 2022). The SDG Accord (2019) was developed to allow the tertiary education sector to demonstrate its commitment to playing its part in meeting the SDGs and sharing best practice. "This global partnership provides a platform to come together in a movement to inspire, celebrate, and advance the critical role that education has in delivering the SDGs, and presents this in a coherent Annual Report for use by the UN, governments, business, and wider society. While the sustainability journey of

each institution will reflect its unique context, connecting them together through the SDG Accord offers the opportunity for scaling of impact" (SDG Accord, 2019).

There are currently 1045 known signatories of the SDG Accord including 110 institutions, 103 support organizations, and 817 individuals spread throughout 85 different countries (SDG Accord, 2019). The signatories commit to embedding the SDGs into their education, research, leadership, operations, administration, and engagement activities. A map displaying the global signatories is found in Figure 2 below:

Figure 2

SDG Accord Signatories



Note. The figure represents the 1045 global signatories from the SDG Accord. The SDG Accord is the university and college sector's collective response to the global goals (SDG Accord Report, 2019). SDG Accord, (2019). *The SDG Accord Report 2019.* http://sdgaccord.org

The SDG Accord is a public declaration of an institution's commitment to sharing and reporting on their progress towards the SDGs, giving rich insight into the actions undertaken by higher education and their outcomes in communities and the world at large. The development of programs such as the Regional Centres of Expertise (RCEs) contribute to best practices and the growth of youth education for sustainable development. In 2019, The SDG Accord reported having 110 institutions in 85 countries working towards SDGs (The SDG Accord, 2019). Since the development of the ESD for 2030, other frameworks, organizations, projects, and initiatives have been formed and implemented at the local, regional, and national levels. Universities and outside organizations are now more intentional about implementing sustainable development initiatives that are aligned with achieving the SDGs. Like the RCEs, similar programs have their own systems, activities, and strategies for implementing and tracking sustainable development goals, such as: International Association of Universities (IAU)

- Higher Education and Research for Sustainable Development (HESD)
- Association for the Advancement of Sustainability in Higher Education (AASHE)
- Sustainable Development Solutions Network (SDSN)
- Environmental Association for Universities and Colleges (EAUC)

The SDG Accord (2022) serves several purposes. "First, it is to inspire, celebrate and advance the critical role that education has in delivering the SDGs and the value it brings to governments, business, and wider society. Secondly, the Accord is a commitment learning institutions are making to one another to do more to deliver the goals, to annually report on each signatory's progress, and to do so in ways which share the learning with each other both

nationally and internationally. An objective is that sector SDG reporting metrics will be presented at the annual UN High Level Political Forum" (The SDG Accord, 2022). The Accord can be signed on four levels.

1. Leaders of institutions sign to make a corporate commitment - this must be the highest authority such as Vice Chancellor, Principal, President etc.
2. Leaders of related university and college support organizations sign to make a corporate commitment to supporting the sector.
3. Leaders of student associations
4. Individual students, researchers, academics, and operational staff can sign to make a personal and professional commitment to playing their part in advancing sector performance (The SDG Accord, 2022).

The UN. Secretary General (2019) discusses preparation for the next phase of education for sustainable development that covers 2020–2030. The ESD for 2030 Framework was developed through broad consultations with various stakeholders from 2016 to 2018. The proposed future framework for ESD was reviewed and adopted by the UNESCO Executive Board. In 2019, at the 40th UNESCO General Conference, new global framework on Education for Sustainable Development Goals called ESD for 2030 Framework was adopted by the 206th Executive Board for the period of 2020-2030 and acknowledged by the 74th UN General Assembly. ESD for 2030 builds on the Global Action Program that aimed to reorient and strengthen education and learning to contribute to all activities that promote sustainable development. It places a stronger focus on education's central contribution to the achievement of the SDGs. ESD for 2030 directly contributes to SDG Goal 4 on quality and inclusive education, particularly target 4.7 (UNESCO, 2020).

The proposed name for the framework to support the post-GAP position is Education for Sustainable Development. This framework works towards achieving the SDGs (UNESCO, 2020). The ESD project designs and implements research and development activities through two flagship initiatives:

1. Regional Centres of Expertise on ESD (RCEs): a multi-stakeholder global network
2. Promotion of Sustainability in Postgraduate Education and Research, and a network of higher education institutions Network

ESD for 2030 Framework aims to build a more just and sustainable world through strengthening ESD and contributing to the achievement of the 17 Sustainable Development Goals. This framework makes clear the aspect of continuity from the current phase of the GAP to the post-GAP position, while highlighting its alignment with the 2030 Sustainable Development Agenda (UNESCO, 2020).

Higher Education Institutions

Education programs for Sustainable Development in Higher Education has become an important initiative in the urgent effort towards achieving SDG goals. Nhamo & Mjimba (2020) explain the importance of implementing the SDGs and how they are developing from Higher Education Institutions. For researchers in sustainability for higher education, there are endless lists of opportunities both academically and practically. The HEI have a crucial role to play in meeting the sustainable development challenges by going beyond advancing training and skills development. In some countries at the national level, ministries of education provide a policy framework for ESD (formal education) and mobilize resources including providing teachers and trainers with the knowledge and information needed to put

ESD into practice (Diemer et. al., 2020). “The HEI must not only produce excellent teachers but uncover ground-breaking research and connect services to communities. This is because HEI generally remain on neutral grounds in the eyes of several stakeholders and are one of the key drivers of economic, social, and other forms of progress of any given country. HEI are encouraged to develop management systems based on the principles embedded in the SDGs” (Nhamo & Mjimba, 2020).

For HEI to accomplish these goals, an effective sustainable development curriculum should be implemented into the institutions and best practices should be demonstrated. According to Bartlett et al. (2020) an effective sustainability curriculum is deliberately constructed with the aim to graduate students with the capacities to be effective, systemic change agents. This is the ultimate goal of ESD. Mcnall et al. (2015) finds the key framework and world view is to be built upon the ethics of care for self, others, environment, nature, and knowledge. Mcnall et al. (2015) describes the key elements of effective curriculum design to be “Sustainability Meta-Competencies” and socio-scientific (SCs) inquiry pedagogies. There are five sustainability core learning meta-competencies:

1. systems thinking
2. temporal thinking
3. interpersonal literacy
4. ethical literacy
5. creativity/imagination

Systems thinking is one of the integral core learning competencies because it is said that the SDG conceptual framework presents itself as a systems-thinking model. A new approach for universities and institutions in higher education is systemic engagement.

Mcnall et al. (2015) believes in the new systemic engagement, which will involve universities as partners in systemic approaches to community change. Systems thinking is one of the key principles of systemic engagement, which helps expand the scope, and allows learners to widen their perspective to consider the wholeness or relationships of concepts or a problem (Mcnall et al., 2015). The introduction and development of the concept of RCEs on Education for Sustainable Development since 2005 has been key in developing the kind of mechanisms leading to better and more creative cooperation, participation, and consultation between a wide range of stakeholders, including for higher education institutions. Programs within universities, such as RCEs are important to help align with ESD. As conventional HEIs are not "purpose-built" for ESD, there may be a need for such institutions to adapt and adopt the concept put forward by the RCEs in transforming education for sustainable development (The United Nations University, 2018).

Regional Centres of Expertise

In 2002, the UN General Assembly adopted a resolution announcing the Decade of Education for Sustainable Development (UNDESD 2005-2014), based on the Johannesburg Plan of Implementation. The United Nations Scientific and Cultural Organization (UNESCO), the lead agency for the UNDESD, stressed the need to reorient existing education towards sustainability (RCE Network, 2021). In 2003, one initiative was to create a multi-stakeholder global network of RCEs on ESD. The RCE on ESD movement which began in 2003 and officially launched in 2005, is inspired by a unique concept of working across formal and informal educational sectors. The leaders work to cultivate learning environments that are participatory, reflective, action-focused, and change-oriented (The United Nations University, 2018). "The RCE Network is made up of schools, community

and volunteer groups, the business sector, universities, and non-governmental organizations" (Atkinson & Wade, 2014). The ESD team at the UNU-IAS has been engaged with the champions of the RCEs in consolidating knowledge of their regions and across the regions. This collaboration has shown to be productive in reflecting on multiple areas of development where analysis has been made accessible for the international community through the earlier publications.

The RCE Network (2021) provides a framework for strategic thinking and action on sustainability by creating diverse partnerships among educators, researchers, policymakers, scientists, youth, leaders within indigenous communities and throughout the public, private and non-governmental sectors. As of August 2021, 181 RCEs have officially been acknowledged by the United Nations University worldwide. The Global RCE Service Centre is headquartered at UNU-IAS, where it provides assistance to individual RCEs and facilitates their communication and networking. Figure 3 below is a map of the 181 RCE's and where they are located around the globe.

Figure 3

Regional Centers of Expertise around the World

Note. Regional Centres for Expertise (181) around the world. https://rcenetwork.org

The RCE Network (2021) vision is to aspire to translate global objectives into the context of the local communities in which they operate. Upon the completion of the DESD in 2014, RCEs are committed to further generating, accelerating, and mainstreaming ESD by implementing the Global Action Program (GAP), and contributing to the realization of the Sustainable Development Goals. At the regional level, Sustainable Development Goal 4 contributes to the enhancement of the national-regional-global nexus for effective coordination and implementation. A common understanding of Goal 4 was built and set the foundation for upscaled commitment through the adoption of regional road maps for Goal 4 – Education 2030 implementation (UN Secretary General, 2019).

The RCE Network (2021) mission recognizes that the planet faces a number of sustainability challenges, ranging from climate change and the rapid extinction of species to the necessary modification of our consumption patterns. “International platforms exist to tackle each of these issues: the United Nations Framework Convention on Climate Change (UNFCCC) mission is to reduce greenhouse gas emissions globally, keeping in mind action need to happen at the local level; the 10 Year Framework Program on Sustainable Consumption and Production (10YFP on SCP)” (RCE Network, 2021). In addition, the mission examines how we can make better use of the plant’s resources. “The consumer behavior and industrial production patterns can shift towards a more sustainable use of the planet’s resources; and the Convention on Biological Diversity (CBD) as well as the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES), both platforms bring scientists and policy makers together in a mission to protect the world’s biota” (RCE Network, 2021).

Each of these global platforms needs to be implemented at a local level. With their official links to UN agencies, formal education institutions, and informal educators worldwide, RCEs are in an ideal position to do just that. “The RCE network brings together multi-sectoral and interdisciplinary members who might not usually work together. As such, they are uniquely placed to help create solutions to sustainability challenges through dialogue, education, and learning. Although they are not required to, some RCE’s may aspire be highly influential policy advocates, able to test policies individually, and work collectively to bring policy to scale and advice on future actions” (RCE Network, 2021).

Many years later, the RCE community is a good place to seek insights into partnerships between knowledge institutions and communities. Part of the Education for

Sustainable Development Initiatives include the development of Regional Centres of Expertise (RCE) which build upon regions' strengths to place equity and justice at the center of sustainable development. "An RCE is a network of existing formal, non-formal, and informal organizations that facilitate learning towards sustainable development in local and regional communities" (The United Nations University, 2018). The RCE concept and strategy for its implementation as well as ensuing work for supporting the global RCE network was developed as a response to the United Nations Decade of Education for Sustainable Development. The RCE's global network has currently 181 United Nations-affiliated RCEs on Education for Sustainable Development, that advance the UN's Sustainable Development Goals through education and training (RCE Network, 2021).

Other RCE initiatives focus on Goal 4 and include sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity. As multi-stakeholder networks, RCEs are equally focused on Goal 17- Partnerships for the Goals. As explained by Hirsh et. al. (2021) this focus on process is generally overlooked in sustainability education, which tends to emphasize outcomes. However, RCEs are grounded in the understanding that to achieve sustainable development, they need to transform both the ways members work together and what they consider to be "knowledge" and "expertise." "They spend significant time figuring out how to collaborate across domains, fields, and demographics to unlock knowledge, especially from marginalized communities, and then combine different types of knowledge and expertise to create innovative directions forward" (Hirsh et. al., 2021). RCE programs aim not to accomplish a single outcome, but to continuously strive to improve societal

impact and creating change. The United Nations University (2018) explains RCEs in further detail:

> This concept of RCEs allows for flexibility that genuinely encourages inclusion and infusion of grassroot in-depth articulation and involvement in a bottom-up fashion. It is therefore not surprising that the RCEs have multiplied by leaps and bounds and include 181 entities worldwide in the last decade. This provides windows of opportunity to collaborate and co-create while translating 'new' and 'novel' experiences into mainstream practices. In this way, RCEs deepen the understanding of sustainable development so that it will be better rooted and become a way of life, translating valuable lessons from the past for the benefit of the future generations, thus connecting the two. In short, communities become the central dynamic repositories where sustainable development practices, well documented and alive, can be anchored and referenced for others to emulate and improvise.

Through these efforts, RCEs help prepare local leaders of tomorrow with the tools and information they need to make smart and sustainable choices for the future. RCE efforts encourage innovation and new approaches to sustainable development. They translate existing knowledge into concrete actions and empower individuals to make sustainable choices for themselves and their communities (RCE Network, 2021). "The success each RCE achieves on the local level is brought to scale through the global RCE Network worldwide. Local knowledge, expertise, and best practices are shared globally through the network and can be adapted and applied successfully in other regions. RCEs also play a central role in the transfer of global technologies, knowledge, and experiences at the local level through their programs and activities" (RCE Network, 2021).

Chapter 2: Literature Review

Introduction

Goal 4 is the heartbeat of achieving all other SDGs, and requires strong leadership, a collective impact, and true transformational change. “Education for Sustainable Development (ESD) was born from the need for education to address growing sustainability challenges. ESD employs action-oriented, innovative pedagogy to enable learners to develop knowledge and awareness and take action to transform society into a more sustainable one” (UNESCO, 2020). “Building on the UN Decade on ESD (2005-2014) and the Global Action Program on ESD (2015-2019), a new framework, ESD for 2030 was adopted by the 206th UNESCO Executive Board and the 40th UNESCO General Conference and acknowledged by the 74th UN General Assembly” (UNESCO, 2020). Leadership plays a large role in advancing the 17 SDGs and striving to achieve the goals for the 2030 Agenda. According to the International Institute for Sustainable Development (IISD) (2018), the world needs strong leaders to attain sustainable development.

> “The performance of any country, in seeking to achieve the SDGs, to a large extent depends on its leadership. Effective leadership translates into prudent public policy formulation and implementation, as well as good public service delivery, to meet the needs and aspirations of citizens. Achieving the SDGs will require the concerted efforts of governments, the business sector, society, and individual citizens. Innovative leadership and management will be essential for organizations in all sectors to integrate these sustainable development goals into strategic plans and operational activities in service of realizing the 2030 aspirations” (IISD, 2018).

Leadership development is a key component in ESD and achieving Goal 4-Quality Education. “Studies in the contexts of internationalization and ESD in HEIs have shown that leadership practices and activities have significant impacts on the success of a change” (Novawan & Aisyiyah, 2020). Although leadership on ESD is significant to the goal’s effectiveness, unfortunately it is still not valued or implemented by all higher education programs. “The recent implementation of ESD in countries has not been followed with significant development of ESD leadership capacity among the academic staffs involved in the implementation. Therefore, while ESD has hotly been discussed elsewhere, there is a valid concern about the effectiveness of leadership capacity development of ESD actors” (Novawan & Aisyiyah, 2020). Sustainably conscious universities that implement ESD programs understand the importance of having effective leaders and the impact they have on their programs and their students. “Sustainable leadership is complex and transformative because it is multifaceted and a wide range of involvement from the university, community, and stakeholders at the local and national levels” (IISD, 2018). Both leadership and education for sustainable development involve many components, which is why there is not solely one leadership theory applied by researchers on this topic. Leadership development includes a multitude of leadership styles, skills, and qualities from individuals in an ESD program. Although this is a broad topic, leaders involved in ESD for 2030 are aware that in order to accelerate this process and reach the ESD goals, leadership is a non-negotiable aspect of education.

ESD for 2030 Framework

In response to the 2030 Agenda, UNESCO became responsible for helping achieve ESD goals. UNESCO decided to build on the Global Action Program and create the ESD

for 2030, a published guidance framework for education policymakers, curriculum developers, and educators, entitled Education for Sustainable Development Goals (UN Secretary General, 2019). The framework will focus on integrating ESD and the 17 SDGs. "The objective is to fully integrate ESD and the 17 SDGs into policies, learning environments, capacity- building of educators, and the empowerment and mobilization of young people" (UNESCO, 2020). This will need to be done at both the local level and global level. A note from the General Assembly (2019) explains that education for sustainable development empowers learners to take informed decisions and responsible action for environmental integrity, economic viability, and a just society, for present and future generations, while respecting cultural diversity (UNESCO, 2021). It is about lifelong learning and is an integral part of quality education. "Education for sustainable development is holistic and transformational education, which addresses learning content and outcomes, pedagogy, and the learning environment. It achieves its purpose by transforming society. Over the years, education for sustainable development has been transforming and progressing through best practices and the development of new frameworks" (UN Secretary General, 2019). "The new framework builds on the emphasis given to the role of ESD by UN General Assembly Resolution 72/222 which noted ESD as 'an integral element of SDG4 on Education and a key enabler of all the other SDGs.' It aims to reorient education and learning to contribute to sustainable development and to strengthen education and learning in all activities that promote sustainable development" (UNESCO, 2021). With the help of the steering committee, The Global Education Meeting sets clear priorities for education through nine priority areas for collective focused attention and action:

1. Making education and training systems more equitable and inclusive “leaving no one behind”
2. Eradicating illiteracy
3. Including migrants, displaced persons and refugees in education and training systems
4. Providing quality gender-responsive education and training
5. Strengthening education for global citizenship and sustainable development
6. Providing open, flexible, and responsive education and training systems to meet new skill needs
7. Improving teachers, educators, trainers, and school leaders
8. Increasing investment in education

In addition, a web-based platform of resources on all 17 Goals was launched for educators, education planners and practitioners, illustrating how to integrate education for sustainable development into teaching and learning. The resources support all grades from early childhood through higher education to help students and educators achieve the goals. The platform provides pedagogical resources, ideas for classroom activities, multimedia education resources and good practices for each of the 17 Goals, addressed to three education levels: early childhood care and education, primary education, and secondary education. “As the only United Nations agency with a mandate in higher education, UNESCO supports national efforts to enhance quality assured higher education provision in favor of equity and the equal distribution of opportunities for all learners. This is in line with Target 4.3 of SDG 4 which aims, by 2030, “to ensure equal access for all women and men to affordable quality technical, vocational, and tertiary education, including university.

Particular focus is placed on developing countries, notably in Africa" (UNESCO, 2021). The organization supports countries to enhance recognition, mobility, and inter-university cooperation in higher education through the ratification and implementation of the Global Convention on the recognition of qualifications concerning higher education and regional recognition conventions (UNESCO 2020). This new global framework redirects humanity towards a sustainable path and promotes lifelong opportunities for all by implementing guidelines for key competencies and learning objectives to effectively increase learning outcomes and achieve the 2030 goals (UNESCO, 2020).

UNESCO Learning Objectives

UNESCO (2017) published *Education for Sustainable Development Learning Objectives;* a guide used for readers on how to use education, particularly in ESD, and achieving the SDGs. "It identifies learning objectives, suggests topics and learning activities for each SDG, and describes implementation on different levels from course design to national strategies. The document aims to support policymakers, curriculum developers, and educators in designing strategies, curricula, and courses to promote learning for the SDGs. The document is not prescriptive in any way but provides guidance and offers suggestions for learning topics and objectives that educators can select and adapt to fit concrete learning contexts" (UNESCO, 2017). The learning objectives are set as a general guidance for learners of all ages and learning environments. They are not purposefully set to target a specific learning level, but instead they are designed to be relevant for all ages including pre-school up through post-secondary education in both formal and non-formal settings worldwide. This allows room for the learning objectives to be adapted to national or local contexts. For each learning objective, educators and curriculum developers must define the

level to be achieved by their learners and align it with locally relevant topics that emerge in our ever-changing world (UNESCO, 2017).

The UNESCO (2017) guide is effective because it provides differentiation and allows the learning objectives to cover the necessary learning outcomes (including knowledge, skills, attitudes, and behavior) to support the achievement of the SDGs. They are designed and intended to be generally applicable and can used effectively for diverse learning groups that are teaching and learning sustainability at a variety of levels, including:

- Introduction to the SDGs and ESD
- Competency oriented teaching and learning approaches in ESD
- For advanced learners; to deepen their understanding of ESD concepts
- To build on existing work in ESD and related areas such as global citizenship education, human rights education, environmental education, and others.
- To implement ESD into programs
- To strengthen existing ESD programs

Education for sustainable development developed cross-cutting key competencies for sustainability that are relevant to all SDGs. Additionally, ESD allows for the development of specific learning outcomes needed to work on achieving a particular SDG. “The core part of the document summarizes the key competencies for learners to develop in ESD and outlines indicative learning objectives, topics and pedagogical approaches for each of the 17 SDGs” (UNESCO, 2017). With the fast pace of increasing technology and globalization, societies around the world encounter many new challenges. “These include increasing complexity and uncertainty; more individualization and social diversity; expanding economic and cultural uniformity; degradation of the ecosystem services upon which they depend; and greater

vulnerability and exposure to natural and technological hazards" (UNESCO 2017). These conditions require adapting, creativity, and self-organized action because the complexity of the situation surpasses basic problem-solving processes that go strictly according to plan. People must understand and learn the complex world in which they live, and be able to collaborate, speak up, and act for positive change (UNESCO, 2017).

The sustainability key competencies were developed and represent what sustainability citizens particularly need to deal with today's complex challenges around the world. They are relevant to all SDGs and also enable individuals to relate the different SDGs to each other and be able to see "the big picture" of the 2030 Agenda for Sustainable Development (UNESCO, 2017). "Sustainability citizens need to have certain key competencies that allow them to engage constructively and responsibly with today's world" (UNESCO, 2017). Competencies must be developed by learners themselves through action, experiences, and reflection. "Competencies describe the specific attributes individuals need for action and self-organization in various complex contexts and situations. They include cognitive, affective, volitional, and motivational elements; hence they are an interplay of knowledge, capacities and skills, motives, and affective dispositions" (UNESCO, 2017). Key competencies for sustainability are for all learners and age levels worldwide, and must be transversal, multifunctional, and context independent. The following key competencies are generally seen as crucial to advance sustainable development as seen in Figure 4 below:

Figure 4

UNESCO's Key Competencies for Sustainability

Box 1.1. Key competencies for sustainability

Systems thinking competency: the abilities to recognize and understand relationships; to analyse complex systems; to think of how systems are embedded within different domains and different scales; and to deal with uncertainty.

Anticipatory competency: the abilities to understand and evaluate multiple futures – possible, probable and desirable; to create one's own visions for the future; to apply the precautionary principle; to assess the consequences of actions; and to deal with risks and changes.

Normative competency: the abilities to understand and reflect on the norms and values that underlie one's actions; and to negotiate sustainability values, principles, goals, and targets, in a context of conflicts of interests and trade-offs, uncertain knowledge and contradictions.

Strategic competency: the abilities to collectively develop and implement innovative actions that further sustainability at the local level and further afield.

Collaboration competency: the abilities to learn from others; to understand and respect the needs, perspectives and actions of others (empathy); to understand, relate to and be sensitive to others (empathic leadership); to deal with conflicts in a group; and to facilitate collaborative and participatory problem solving.

Critical thinking competency: the ability to question norms, practices and opinions; to reflect on own one's values, perceptions and actions; and to take a position in the sustainability discourse.

Self-awareness competency: the ability to reflect on one's own role in the local community and (global) society; to continually evaluate and further motivate one's actions; and to deal with one's feelings and desires.

Integrated problem-solving competency: the overarching ability to apply different problem-solving frameworks to complex sustainability problems and develop viable, inclusive and equitable solution options that promote sustainable development, integrating the above-mentioned competences.

Note. Learning Objections. Rieckmann, et. al., (2017). *Education for Sustainable Development Goals: Learning Objectives.* UNESCO, 2017.

The specific learning objectives are seen in conjunction with the cross-cutting sustainability competencies. Specific learning objectives must be set for the different SDGs, but it is vital to remember that these objectives must not be viewed as isolated from the sustainability key competencies that will support us in our transition to a sustainable world. "Learning both the learning objectives and key competencies must be pursued together. The guidelines set for the learning objectives are therefore informed by methods and best practice for developing competencies. When using this guidance framework, educators are encouraged to consider

what key competencies their educational activities are facilitating, in addition to the specific learning objectives described for each SDG in the following section" (UNESCO, 2017). The UNESCO (2017) learning objectives that fall under all 17 SDGs are described, and focused in three domains:

1. *Cognitive domain*- comprises knowledge and thinking skills necessary to better understand the SDG and the challenges in achieving it.
2. *Socio-emotional domain*- includes social skills that enable learners to collaborate, negotiate and communicate to promote the SDGs as well as self-reflection skills, values, attitudes, and motivations that enable learners to develop themselves.
3. *Behavioral domain*- describes action competencies. Additionally, for each SDG, indicative topics and pedagogical approaches are outlined.

Table 1 below represents the learning objectives from each of the 17 SDGs. Within each of the 17 SDGs are examples of learning objectives that fall within each of the three domains. The researcher purposefully chose each of the learning objectives because they are most relevant for the study and reflect on each of the three domains:

Table 1

UNESCO Learning Objectives:

SDG Goals	Cognitive Learning Objective	Socio-emotional Learning Objective	Behavioral Learning Objective
Goal 1-No Poverty	The learner understands the concepts of extreme and relative poverty and is able to critically reflect on their underlying cultural and normative assumptions and practices.	The learner is able to collaborate with others to empower individuals and communities to affect change in the distribution of power and resources in the community and beyond.	The learner is able to propose solutions to address systemic problems related to poverty
Goal 2- Zero Waste	The learner knows about the amount and distribution of hunger and malnutrition locally, nationally, and globally, currently as well as historically.	The learner is able to communicate on the issues and connections between combating hunger and promoting sustainable agriculture and improved nutrition.	The learner is able to take on critically their role as an active global citizen in the challenge of combating hunger.
Goal 3- Good Health and Well-Being	The learner knows conceptions of health, hygiene and well-being and can critically reflect on them, including an understanding of the importance of gender in health and well-being.	The learner is able to encourage others to decide and act in favor of promoting health and well-being for all.	The learner is able to include health promoting behaviors in their daily routines.
Goal 4- Quality Education	The learner understands the important role of education and lifelong learning opportunities for all (formal, non-formal and informal learning) as main drivers of sustainable development, for improving people's lives and in achieving the SDGs.	The learner is able to recognize the intrinsic value of education and to analyze and identify their own learning needs in their personal development. The learner is able to recognize the importance of their own skills for improving their life, in particular for employment and entrepreneurship. The learner is able to engage personally with ESD.	The learner is able to use all opportunities for their own education throughout their life, and to apply the acquired knowledge in everyday situations to promote sustainable development. The learner is able to promote the empowerment of young people
Goal 5- Gender Equality	The learner understands levels of gender equality within their own country and culture in comparison to global norms (while respecting cultural sensitivity), including the intersectionality of gender	The learner is able to recognize and question traditional perception of gender roles in a critical approach, while respecting cultural sensitivity.	The learner is able to observe and identify gender discrimination. The learner is able to plan, implement, support, and evaluate

	with other social categories such as ability, religion, and race.	The learner is able to reflect on their own gender identity and gender roles. The learner is able to feel empathy and solidarity with those who differ from personal or community gender expectations and roles	strategies for gender equality.
Goal 6- Clean Water and Sanitation	The learner understands water as a fundamental condition of life itself, the importance of water quality and quantity, and the causes, effects and consequences of water pollution and water scarcity. The learner knows about the global unequal distribution of access to safe drinking water and sanitation facilities.	The learner is able to feel responsible for their water use. The learner is able to see the value in good sanitation and hygiene standards.	The learner is able to reduce their individual water footprint and to save water practicing their daily habits.
Goal 7- Affordable and Clean Energy	The learner knows about different energy resources, renewable and non-renewable, and their respective advantages and disadvantages including environmental impacts, health issues, usage, safety and energy security, and their share in the energy mix at the local, national, and global level.	The learner is able to clarify personal norms and values related to energy production and usage as well as to reflect and evaluate their own energy usage in terms of efficiency and sufficiency.	The learner is able to apply basic principles to determine the most appropriate renewable energy strategy in a given situation.
Goal 8- Decent Work and Economic Growth	The learner understands the concepts of sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work, including the advancement of gender parity and equality, and knows about alternative economic models and indicators.	The learner is able to identify their individual rights and clarify their needs and values related to work.	The learner is able to engage with new visions and models of a sustainable, inclusive economy and decent work.
Goal 9- Industry, Innovation, and Infrastructure	The learner understands the concepts of sustainable infrastructure and industrialization and society's needs for a systemic approach to their development.	The learner is able to recognize and reflect on their own personal demands on the local infrastructure such as their carbon and water footprints and food miles.	The learner is able to identify opportunities in their own culture and nation for greener and more resilient approaches to infrastructure, understanding their

			overall benefits for societies, especially with regard to disaster risk reduction.
Goal 10- Reduced inequalities	The learner knows different dimensions of inequality The learner understands that inequality is a major driver for societal problems and individual dissatisfaction.	The learner becomes aware of inequalities in their surroundings as well as in the wider world and is able to recognize the problematic consequences.	The learner is able to evaluate inequalities in their local environment.
Goal 11- Sustainable Cities and Communities	The learner understands basic physical, social and psychological human needs and is able to identify how these needs are currently addressed in their own physical urban, peri-urban and rural settlements.	The learner is able to feel responsible for the environmental and social impacts of their own individual lifestyle.	The learner is able to plan, implement and evaluate community-based sustainability projects.
Goal 12- Responsible Consumption and Production	The learner understands how individual lifestyle choices influence social, economic, and environmental development.	The learner is able to envision sustainable lifestyles.	The learner is able to plan, implement and evaluate consumption-related activities using existing sustainability criteria.
Goal 13- Climate Action	The learner knows which human activities – on a global, national, local, and individual level – contribute most to climate change.	The learner is able to encourage others to protect the climate.	The learner is able to support climate-friendly economic activities.
Goal 14- Life Below Water	The learner understands the connection of many people to the sea and the life it holds, including the sea's role as a provider of food, jobs, and exciting opportunities.	The learner is able to reflect on their own dietary needs and question whether their dietary habits make sustainable use of limited resources of seafood.	The learner is able to research their country's dependence on the sea.
Goal 15- Life on Land	The learner understands basic ecology with reference to local and global ecosystems, identifying local species and understanding the measure of biodiversity.	The learner is able to connect with their local natural areas and feel empathy with nonhuman life on Earth.	The learner is able to connect with local groups working toward biodiversity conservation in their area.
Goal 16- Peace, Justice, and Strong Institutions	The learner understands concepts of justice, inclusion and peace and their relationship to law.	The learner is able to reflect on their role in issues of peace, justice, inclusion, and strong institutions.	The learner is able to contribute to conflict resolution at the local and national level.
Goal 17- Partnerships for the Goals	The learner understands the importance of global multi-stakeholder partnerships and the shared accountability for sustainable development	The learner is able to create a vision for a sustainable global society. The learner is able to raise awareness about the	The learner is able to become a change agent to realize the SDGs and to take on their role as an active, critical, and

	and knows examples of networks, institutions, campaigns of global partnerships.	importance of global partnerships for sustainable development. The learner is able to take ownership of the SDGs.	global and sustainability citizen. The learner is able to contribute to facilitating and implementing local, national, and global partnerships for sustainable development.

Note. The UNESCO Learning Objectives (UNESCO, 2017) is a 62-page document that can be retrieved from https://en.unesco.org/themes/education/sdgs/material. The table represents specific examples chosen by the researcher that best align with the study.

Leadership Development in ESD Programs

Leadership development in education for sustainable development is essential for a multitude of reasons and should be implemented into all levels of learning. Organizations such as UNESCO provide global and regional leadership in education which ultimately strengthens national education systems and responds to contemporary global challenges through education. The IISD (2018) explains that if our world is going to achieve the SDGs by 2030, leadership at both the national and organizational levels would have to adopt leadership styles that engender a sense of shared responsibility toward the attainment of the goals. "One that is focused on the long-term, and thus would establish systems that persistently ensure the pursuance of this goal in the future; one that understands the need for collective effort toward the attainment of the SDGs; one that is willing to learn; and, finally, one that is in itself ethical, and thus would impress upon followers the need to behave in a like manner" (IISD, 2018).

Although it is important to implement leadership in ESD at the regional, national, and global level, it is also important to implement this at the local level, and starting with our

youth. “Empowering and mobilizing young people of all genders, therefore, is a central part of ESD implementation” (UNESCO 2020). “The urgency of the current challenges calls for strong leadership from Member States to mainstream ESD in all activities on education and sustainable development at the country level as a part of their implementation of SDG 4 and all the other SDGs. To this end, ESD for 2030 focuses on Member States’ initiatives towards the achievement of the SDGs” (UNESCO 2020). Member states should be focusing on three elements:

1. The five priority action areas
2. Engage all concerned stakeholders
3. Advocate and mobilize resources

The ESD for 2030 roadmap sets out the urgent challenges facing the planet and underlines the implementation of the new framework, which aims to increase the contribution of education to building a more just and sustainable world (UNESCO, 2021). The ESD for 2030 roadmap outlines actions in five priority action areas to stress ESD’s key role for the successful achievement of the 17 SDGs and the great individual and societal transformation required to address the urgent sustainability challenges. “In implementing activities for the priority action areas, Member States are invited to mobilize the concerned stakeholders working in the five areas and support their collaborative networking under a coordinated strategy, related to the national framework on the SDGs” (UNESCO, 2020). The five action areas include:

1. Advancing Policy
2. Transforming Learning Environments
3. Building Capacities of Educators

4. Empowering and mobilizing youth
5. Accelerating local level actions

To complement the ESD for 2030 Roadmap, UNESCO has developed the ESD for 2030 toolbox. This toolbox provides an evolving set of selected resources to support Member States, as well as regional and global stakeholders to develop activities in the five priority action areas and activities in support of the six key areas of implementation (UNESCO, 2021). The ESD for 2030 Roadmap underlines six key areas of implementation which include:

1. Implementing ESD for 2030 at the country level
2. Harnessing partnership and collaboration
3. Communicating for action
4. Tracking issues and trends
5. Mobilizing resources
6. Monitoring progress

There should also be more concrete efforts to develop communication and advocacy actions to reflect the SDGs in educational practices and frameworks. Nationwide multi-stakeholder initiatives can be set up to support ESD for 2030 at the country level. The leaders of current higher education sustainable development programs influence the direction and effectiveness of their program. A leader's role is to have a positive influence on their followers individually and collectively. "The leadership functions related to the followers' acceptance and commitment are found paramount for giving impacts on the achievement of the expected purposes" (Hassan, Gallear, & Sivarajah, 2018). An effective leader for an ESD program (such as a professor, program coordinator, or supervisor) will see

organizational growth while also positively increasing their followers' development as independent leaders for the future. With less than a decade left to achieve the ESD for 2030 goals, leadership development is crucial for students in these programs. "Considering the breadth and the depth of ESD curriculum development, while the nature of activities related to HEIs' curriculum and pedagogy are context dependent, any changes confront the leaders with the complexity that requires effective leadership functions to facilitate successful changes" (Novawan & Aisyiyah, 2020). In this context, leadership is required to influence people, encourage achievements, and create new leaders within the unprecedented contexts of higher education. Leadership in sustainable development is a collaborative effort because the organizational design features interdisciplinary and multi-actor components. To address the wide range of diverse challenges, developing students as leaders in essential and necessary for the achievement of the SDGs (Bass & Regio, 2006). The quality of the sustainable development programs, including curriculum and experiential learning combined with having an effective leader, will result in positive change. "The need for curriculum reform had been socialized to top university leaders by deploying the emergent issues on globalization and ESD" (Novawan & Aisyiyah, 2020).

In a case study analysis, Missimer & Connell (2012) reflect on the pedagogical skills of teaching and learning on education for sustainable development. Their research looks at how these theories and methods can be put into practice by examining a real-world example of a sustainability master's program at Blekinge Institute of Technology (BTH) in Sweden. In 2004, BTH launched the international transdisciplinary master's program called "Strategic Leadership towards Sustainability" (Missimer & Connell, 2012). "This 10-month program aims to develop leaders who will be able to address the ever-increasing sustainability

challenge. It combines a robust scientific framework for planning and decision making toward sustainability (known as the Framework for Strategic Sustainable Development, or the Natural Step Framework), with the personal and organizational leadership skills needed to energize large-scale societal change" (Missimer & Connell, 2012). During the case study, the program alumni were surveyed to discern to what degree their sustainability leadership skills successfully evolved during their participation. "The program focused on two themes. The first is a planning and decision-making framework for moving toward sustainability, known as the Framework for Strategic Sustainable Development (FSSD). The second theme is organizational learning and change, inquiring into how to use both personal and collective leadership to help energize change" (Missimer & Connell, 2012). The results of their study demonstrated that the student's leadership skills were strengthened by the end of their participation in the program. "Specific leadership skills that the students scored highly on were skills connected to working with others, ability to inspire or create a shared vision with others, the ability to work in diverse groups, and the ability to resolve conflicts" (Missimer & Connell, 2012). This confirmed their hypothesis; by implementing best practices into the curriculum, that much can be achieved within the current academic and pedagogical system (Missimer & Connell, 2012).

Leadership in Theory

Leadership theories can be incorporated into almost any discipline or career. "The theories of leadership and management in HEIs have been extensively addressed; nevertheless, how to influence and improve the effectiveness of practices within the diversity of contexts remains challenging" (Novawan & Aisyiyah, 2020). "ESD requires is a shift from teaching to learning. It asks for an action-oriented, transformative pedagogy, which supports self-directed

learning, participation and collaboration, problem-orientation, inter- and transdisciplinary and the linking of formal and informal learning. Only such pedagogical approaches make possible the development of the key competencies needed for promoting sustainable development" (UNESCO, 2017).

Trait Theory

Northouse (2019) explains the trait approach as one of the first systematic attempts to study leadership theory, or the notion that leaders possessed certain traits more than non-leaders. "The theories that were developed were called 'great man' theories because they focused on identifying the innate qualities and characteristics possessed by great social, political, and military leaders" (Northouse, 2019). This is another way to explain how traits may influence leadership. Although leadership skills and knowledge are believed to have the capability to being developed over time, there are also innate characteristics that some leaders seem to naturally have over others. Social and emotional intelligence are two concepts that developed in the 1990s. Both are similar in the sense that they focus on the ability to understand the thoughts and emotions of others. "Great leaders who are more sensitive to their emotions, and to the emotions of others, will be leaders who are more effective" (Northouse, 2019). The trait theory is different from other theories because it focuses more on the personal awareness and development of the leader. By implementing leadership development into higher education sustainable development programs, we can help sustainability leaders become more self-aware, focus on their own personal development, and be able to identify strengths and weaknesses both within themselves and in their roles within the organizations. Other researchers agree that recognizing personal traits will benefit individuals by helping them understand ways they can improve and grow into effective leaders.

In addition to leadership traits being developed internally within oneself, the effectiveness of educators and leaders in higher education programs could have a positive impact on the leadership development of their students. Phelps (2008), a researcher in education, discusses resiliency as another key disposition relative to teacher leadership; those who are teacher-leaders will enhance their students and eventually their school climate. Phelps (2008) also puts a large emphasis in leaders being able to have vision. “Becoming a teacher-leader is not without obstacles. Teachers must understand the existence of possible barriers and work to overcome them. Having a clearly defined vision is a way to operate within these constraints. Because having a vision makes it easier to focus on what is most important, distractions are less potent” (Phelps, 2008). Teacher-leaders must also develop their personal characteristic and innate traits that will contribute to an increase in their leadership. Phelps (2008) describes other self-imposed constraints to leadership and contributes this to teachers having a lack of self-confidence. “A supportive environment can help to build teachers' confidence” (Phelps, 2008).

Skills Approach

Similar to the trait theory, the skills approach takes a leader-centered perspective on leadership. Northouse (2019) defines leadership skills as the ability to use one’s knowledge and competencies to accomplish a set of goals and objectives. “In the skills approach, we shift our thinking from a focus on personality characteristics, to an emphasis on skills and abilities that can be learned and developed over time” (Northouse, 2019). The trait approach focuses more on individual characteristics, but the skills approach suggests that knowledge and abilities are needed for effective leadership (Northouse, 2019). The skills approach to leadership is important in ESD programs because it is a discipline that requires a varied skill

set. “The skills approach to leadership provides a structure for understanding the nature of effective leadership” (Northouse, 2019). Another benefit to the skills approach is that is offers valuable information about leadership. “The approach provides a way to delineate the skills of the leader, and leaders at all levels in any organization can use it” (Northouse, 2019).

Transformational Leadership

Johns & Moser (1989) explained leadership theory development over time and discusses how empirical evidence began to challenge personal trait and unidimensional views of leadership. “Empirical studies suggest that leadership is a dynamic process varying from situation to situation, with changes in leaders, followers, and situations” (Johns & Moser, 1989). Research began taking a closer look at situational leadership and adaptive leadership theories. “Adaptive leader behavior questions the existence of a ‘best’ style of leadership. It is not a question of best style but of the most effective style for a particular situation” (Johns & Moser, 1989). Adaptive leadership is a form of situational leadership, because within both theories, the leader would demonstrate effective leadership in any situation. According to Johns & Moser (1989), the best embodiment of current leadership theory is the transformational leadership, where adaptive leadership lies at the center with change. John & Moser (1989) explain how, in the beginning of leadership research, traits were seen as the most important to research. In recent years, we view leadership and consider larger factors relating to sociology and the transformations of organizations. “Transformational leaders are effective because they are continuous learners, motivate their followers, and mobilize commitment within their organization. Transformational leaders persuade others to endure changes and show them how to adapt to these changes” (Johns & Moser, 1989).

The transformational leadership theory is one of the more popular approaches to leadership and applied in recent education for sustainable development studies. Although transformational leadership has been studied since the 1970's, it is part of the "New Leadership" paradigm, which gives more attention to the charismatic and affective elements of leadership. Northouse (2019) describes transformational leadership as a process that changes and transforms people. It is concerned with emotions, values, ethics, standards, and long-term goals. It includes assessing followers' motives, satisfying their needs, and treating them as full human beings. "Transformational leadership involves an exceptional form of influence that moves followers to accomplish more than what is usually expected of them. It is a process that often incorporates charismatic and visionary leadership. People who exhibit transformational leadership often have a strong set of internal values and ideals, and they are effective at motivating followers to act in ways that support the greater good rather than their own self-interests" (Northouse, 2019). Northouse (2019) explains individuals' intentions to lead in a transformational manner appear related to effective transformational leadership behaviors, which was inspired from Bass and Avolio (1994) transformational leadership model, the "Full Range of Leadership Model". The four transformational include the following:

1. Idealized influence- the perceptions followers have on their leaders
2. Inspirational motivation- inspires followers to become committed to their organization through motivation
3. Intellectual Stimulation- leadership that stimulates followers to be creative and innovative

4. Individualized Consideration- leaders who provide support and recognize their followers' needs.

"Transformational Leadership has an additive effect; it increases intrinsic motivation and moves followers to accomplish more than what is expected of them. They become motivated to transcend their own self-interests for the good of the group or organization" (Bass & Aviolo, 1994). "The Transformational approach to leadership is a broad-based perspective that encompasses many facets and dimensions of the leadership process. In general, it describes how leaders can initiate, develop, and carry out significant changes in organizations" (Northouse, 2019). Transformational leadership not only has positive impacts on organizational change but has also demonstrated that it contributes to the leaders' personal growth (Notgrass, 2014).

"Sustainability leaders understand the importance of transformational leadership and encourage learners to undertake transformative actions for sustainability to shape a different future, before it is too late" (UNESCO, 2020). In a recent UNESCO (2020) study, they reviewed 10 different policy documents that showed ESD is mostly associated with the teaching of scientific knowledge on environment. "This is not enough to bring the transformative power of education to full force. ESD is interpreted with narrow focus on topical issues rather than with a holistic approach on learning content, pedagogy, and learning outcomes to bring about the fundamental behavioral shift to sustainable development" (UNESCO, 2020). UNESCO (2020) believes learners can be encouraged to make transformational change and recommends the following:

- Ensure individuals are able to understand sustainability challenges

- To be aware of their relevance to the surrounding realities, and take action for change
- To trigger structural transformations in today's economic and social systems by promoting alternative values and contextualized methods
- To address the new opportunities and risks on sustainable development posed by emerging technologies
- Education needs to transform itself
- UNESCO's new global framework called ESD for 2030

Collective Impact

Transformational leaders understand the only way to have true transformational takes a collective impact across many networks, working together to achieve a common goal. The leaders of HEIs must develop this type of systems thinking in the urgent need to shift and create transformational change. According to Poleman, Nan Jenks-Jay, and Jack Byrne (2019), all leaders in HEIs must harness the power of a collective impact, "a framework for creating cross-sector coordination and collaboration to advance large-scale social change. This involves connecting re-search and practice, promote sustainability solutions at every scale, and empowering students to live consequential, engaged lives" (Poleman, Nan Jenks-Jay, and Jack Byrne (2019).

There have been recent local, national, and global events purposefully planned by using a collective approach in support of the 17 SDGs. For example, the United Nations HESI holds an annual special event during the High Level Political Forum (HLPF) to highlight the critical role of higher education in achieving sustainable development. "This event is focused on forming the current and future generation of leaders, driving the research

and policy agenda for both the public and private sectors, as well as facilitating multi-stakeholder collaboration at the local and global level" (United Nations, 2021). In addition, this forum is meant to collectively bring together key actors to highlight the challenges, the opportunities, and lessons learned to advance the SDGs. One specific outcome of this event involved several action-oriented conversations about the collective systemic change needed to realize the urgent call to action and ways to achieve the 2030 Agenda.

Chapter 3: Methodology

Study Design

The purpose of this study is to evaluate the leadership development of higher education students involved in sustainable development programs. For this study, an integrated data analysis and interpretation within complex design was applied specifically by creating a mixed methods case study design using qualitative and quantitative data. The unit of analysis included four organizations that target youth development in higher education sustainable development programs from CCU. Four groups were evaluated including:

1 RCE Georgetown (18 participants)

2 Solar Ambassadors (12 participants)

3 Sustain Coastal: Eco-Reps (6 participants)

4 Sustain Coastal: Green Team (4 participants)

Within the ESD programs, students are involved in experiential learning activities. These programs are designed to develop higher education students as sustainability leaders in the 21st century. Creswell & Clark (2018) explain that in complex designs, the researcher intersects one (or more) of the core designs with another design, methodology, or theory. Therefore, the basic mixed methods data analysis and integration considerations for integration intent, procedures, representation, and interpretation discussed for the core designs also apply to these more complex applications. In addition, researchers need to consider how these considerations are adapted and aligned to the specific type of complex design. A mixed methods case study design involves embedding both quantitative and qualitative data into a case or cases (Creswell & Clark, 2018). The intent of this design is to develop in-depth cases through integrating multiple sources of data. The procedure for data

analysis consists of analyzing both sets of data separately and then using the combined data to document or generate a case or cases. Further analysis consists of making cross-case comparisons if multiple emerge.

Rationale

Case study research explained by Creswell & Poth (2018) has a long-distinguished history across many disciplines beginning as early as the 1920's. Today, case study researchers can choose an array of quantitative and qualitative case study approaches. Creswell & Poth (2019) describes case study research as beginning with the identification of a specific case that will be described and analyzed. Examples of a case for study are an individual, a community, a decision process, or an event. A single case can be selected, or multiple cases are identified so they can be compared. Typically, case study researchers study current, real-life, cases that are in progress in order to gather accurate information. The key to the case identification is that it is bounded, meaning that it can be defined or described within certain parameters. "Case study research is not a methodology but a choice of what is to be studied by using a bounded system, bounded by time and place" (Creswell & Poth, 2018). Examples of parameters for bounding a case study are the specific place where the case is located, or the timeframe in which the case is studied. On occasion, certain people involved in the case may also be defined as a parameter (Creswell & Poth, 2018). For this research, a collective case study (or multiple case study,) is applied, by selecting multiple case studies to illustrate the issue.

According to Cook & Kamalodeen (2019) case study and mixed methods research are not separate entities. Rather, the boundary between them is permeable and fluid, allowing each to either support or lead in a research endeavor. A comparison case study

approach with a mixed methods analysis is used to evaluate leadership development in education for sustainable development in higher education institutions. The unit of analysis is programmatic, meaning that the researcher will look at sustainability programs within these organizations to provide an illustration of the leadership growth and development, along with the students' experience throughout their program. I used purposeful sampling for the unit of analysis by choosing four different organizations CCU as a lens to analyze leadership development within the higher education programs to help advance ESD goals for 2030.

The four organizations were selected from CCU for a variety of reasons, but the main one being that they all contribute to the institution's progress in sustainable development. In addition, these organizations were chosen because of the differentiation of the type of organization, as well as the differences in mission, structure, and roles and responsibilities. The programs are a mix of both RCE-affiliated and non-RCE affiliated. By selecting these four as cases, diverse perspectives were examined which provided the researcher with a deeper meaning and understanding of the findings. The researcher investigated different perspectives and analyzed the leadership development of the individuals within each of the programs, the sustainability content knowledge gained from each of the programs, as well as looking at the findings of the programs' collective impact on the university. The researcher was also able to compare and analyze the findings of the RCE to non-RCE programs, to evaluate the students' growth in sustainability while striving to achieve the 2030 goals in the Spring 2022 semester.

Regional Centres of Expertise

According to the RCE Network (2021) an RCE is a network of existing formal, non-formal and informal organizations that facilitate learning towards sustainable development in local and regional communities. A network of RCEs worldwide will constitute the Global Learning Space for Sustainable Development. An RCE should have four core elements:

1. Governance - addressing issues of RCE management and leadership
2. Collaboration - addressing the engagement of actors from all levels of formal, non-formal and informal education
3. Research and development - addressing the role of research and its inclusion in RCE activities, as well as contributing to the design of strategies for collaborative activities, including those with other RCEs.
4. Transformative education - contributing to the transformation of the current education and training systems to satisfy ambitions of the region regarding sustainable living

RCE Stakeholders involve teachers, professors at higher education institutions, environmental NGOs, scientists, researchers, museums, zoos, botanical gardens, local government officials, representatives of local enterprises, volunteers, media, civic associations, or individuals who work in the spheres of sustainable development such as economic growth, social development, and environmental protection, students, and learners at all levels. For this study, there were two RCE programs that were chosen to be analyzed and compared within the mixed methods comparative case study analysis.

RCE Georgetown

One of the ESD's initiatives was to create a multi-stakeholder global network of RCEs on ESD. In January 2017, CCU, in partnership with the North Inlet, Winyah Bay National Estuarine Research Reserve (NERR) and Georgetown County, founded Georgetown RISE, a local RCE for Sustainable Development**.** RCE Georgetown became one of the 181 RCE's worldwide. Coastal Carolina University (2021) describes the Georgetown RISE initiative as a program created for a high impact. This transformative learning program called The UN Youth Corps Program, relates directly to sustainable development.

RCE Georgetown's mission is to align Georgetown County with the 17 SDGs by promoting productive dialog and collaboration within the county for today's generation and those to come (Coastal Carolina University, 2021). This program is centered on giving students life skills and professional experiences surrounding issues on sustainable development in Georgetown County. "The effort supports a scientific, research-based perspective, while engaging a place for productive dialog and collaboration on sustainability, enabling a process for incubating student engagement and cultivation of professional talent, and encouraging participation and outreach related to sustainable development. Students participating relate their experiences while in the program to local, national, and international goals" (Coastal Carolina University, 2021).

Solar Ambassadors

The next three groups that were chosen to participate in the study are non-RCE affiliated. However, they are all considered an organization in sustainability at CCU and contribute to the support of the SDGs. Just like Georgetown RISE, The Solar Ambassadors Program was also created by Dr. Pamela Martin and launched in 2015. Rohr (2022)

explained the history of the program, “Dr. Pamela Martin, came to Coastal in 1999 with a focus on energy, sustainable development, and environmental politics. Part of her research has been focused on fossil fuels and oil extraction, specifically in the Amazon and on the Galapagos Islands, but a project she developed with CCU’s Athenaeum Press shifted her trajectory” (Rohr, 2022).

In 2014, the Press, CCU’s student-run publishing lab, took on a project titled “Powering a New South” which involved interviewing individuals in the local community to find sustainable solutions to current energy problems. “During this time people living along the South Carolina coastline became optimistic at the thought of renewable energy when ACT 236, The Distributed Energy Resource Program Act had been signed into law in South Carolina. This act authorized solar leasing, established guidelines for net energy metering, and provided incentives to utilities that procure renewable energy” (Rohr, 2022).

By 2015, Dr. Martin learned about the RE-volv’s Solar Ambassador Program and applied for CCU to become part of it. Re-volv is a college program based out of California and has a competitive application process from universities all over the country. There are multiple applications required from universities as well as the individual students. Upon the acceptance, Dr. Pamela Martin states, “Ten students responded to that one email,” she said. “Ten students showed up to the first meeting. And 10 students became the first cohort of Solar Ambassadors at Coastal Carolina University” (Martin, 2015). “CCU soon became one of seven universities in the nation, and the only one in the South at that time, to be accepted into the program” (Rohr, 2022).

This special type of program is explained by Dr. Martin, “we have a unique situation as a public, comprehensive university, and we did not come to this project with massive quantities of funding,” said Martin. “This program at CCU is solely based on student initiative and RE-volv support” (Martin, 2015). The partnership with RE-volv requires the Solar Ambassador teams to commit to finding a nonprofit that is interested in having solar panels installed on its facility and seeing the entire process through to completion. The process involves researching solar policies, local energy providers and eligible nonprofits; educating the nonprofits on the benefits of solar and the solar seed fund; marketing and fundraising, and other involvement in the community (Rohr, 2014).

Sustain Coastal-ECO-REPS

The third and fourth groups of participants are the Eco-Reps and the Green Team. Both are part of the Sustain Coastal Initiative. “Sustain Coastal is the TD Campus and Sustainability Initiative that commits itself to transform CCU into an environmentally sustainable university through campus operations, student curriculum, engaging students through learning and outreach, and collaboration in the community through sustainable stewardship of resources” (Coastal Carolina University, 2022a).

Sustain Coastal was established in 2005, and coordinates sustainable services including recycling, food waste composting, water refill stations, conservation, alternative transportation, as well as educational programs and outreach events such as the farmers' markets, Earth Month, Pop-Up Thrift Shop, Landfill on the Lawn, and Campus Salvage (Coastal Carolina University, 2022a). “Sustainability brings together students, staff, faculty, and the community at Coastal Carolina University. You can commit to be sustainable by

recycling, reducing your waste, riding your bike, or volunteering your time" (Coastal Carolina University, 2022a).

Eco-Rep Leaders are select student peer educators at CCU who promote sustainable living. "They develop programs and events that challenge their peers and the campus community to adopt a more sustainable lifestyle" (Coastal Carolina University, 2022b). In addition, Eco-Reps volunteer their time to provide classroom and civic group presentations upon request (Coastal Carolina University, 2022b).

Sustain Coastal-Green Team

The fourth group of participants included the Green Team. "The Green Team is an integral part of the behind-the-scenes work of sustainability at Coastal Carolina University. The Green Team consists of student workers that collect the recyclables on-campus in all academic and administrative buildings, as well as during special events, especially athletic events" (Coastal Carolina University, 2022c).

Procedures for Data Collection

The data analysis for this type of study described by Creswell & Poth (2018) might focus on a few key issues (also known as an analysis of themes, or case themes), not for generalizing beyond the case, but for understanding the complexity of the case. A cross-case analysis is used to help identify themes within each case before looking for common themes that transcend the cases. A typical format is to provide first a detailed description of each case and themes within the case called a within-case analysis, followed by a thematic analysis across the cases, called a cross-case analysis, as well as assertions or an interpretation of the meaning of the case.

The procedures used for this mixed methods comparative case study include a simultaneous data collection approach, by collecting both quantitative and qualitative data that will be further used for the analysis. This method of data collection is known as triangulation and combines multiple data sources for an extensive data collection and analysis. The mixed methods data collection includes the following procedures to obtain the quantitative and qualitative data:

1. Participants will participate in the Leadership Traits Questionnaire (LTQ): Pre-questionnaire
2. Participants will participate in the Leadership Skills Inventory- Pre-questionnaire
3. Participants will participate in the SULITEST- Pre-test
4. Analyze all preliminary quantitative data from the Leadership Traits Questionnaire, the Leadership Skills Inventory, and the SULITEST scores
5. Interview participants to develop a deeper understanding of their leadership growth and development and their sustainable development content knowledge
6. Interview participants' program supervisors
7. Participants will take the Leadership Traits Questionnaire (LTQ): Post-questionnaire
8. Participants will participate in the Leadership Skills Inventory: Post-questionnaire
9. Participants will take the SULITEST: Post-test
10. Integrate all data analyzed and report the findings in the data analysis

Quantitative Methods

The first three phases of the study were part of the quantitative data collection. This included three separate instruments measuring leadership traits, leadership skills, and sustainability literacy. Northouse (2019) developed the first and second measurement tools,

including the Leadership Traits Questionnaire (LTQ) and the Skills Inventory. The third instrument was developed by the creators of the Sulitest.org (2016). Participants took all three of the pre-assessments in the beginning of the semester of January 2022. Then, they took the assessments again, in March of 2022, the midpoint of the semester, in order to measure the progress of their growth and development.

Phase 1: Leadership Traits Questionnaire

The first instrument administered to the participants was the Northouse (2019) Leadership Trait Questionnaire. The purpose of the Leadership Trait Questionnaire is to measure personal characteristics of leadership. The questionnaire consists of 14 leadership traits that are thought to be innate, but may also change or develop over time. Students responded to each of the statements in Table 2, rating themselves on a 1-5 scale, where 1 meant “strongly disagree” and 5 meant “strongly agree.”

Table 2

Northouse (2019) Leadership Traits Questionnaire

Leadership Traits Questionnaire (LTQ) Pre and Post Questionnaire:

Instructions: The purpose of this questionnaire is to measure personal characteristics of leadership. Please rate yourself for each trait (you can indicate by highlighting, or putting the number in bold, different color, etc.)

KEY: **1**= Strongly Disagree **2**=Disagree **3**=Neutral **4**=Agree **5**=Strongly Agree

1. Articulate: Communicates effectively with others
2. Perceptive: is discerning and insightful
3. Self-confident: Believes in himself/herself and his/her ability
4. Self-assured: Is secure with self, free of doubts
5. Persistent: Stays fixed on the goals, despite interference
6. Determined: Takes a firm stand, acts with certainty
7. Trustworthy: Is authentic and inspires confidence
8. Dependable: Is consistent and reliable
9. Friendly: Shows kindness and warmth
10. Outgoing: Talks freely, gets along well with others
11. Conscientious: Is thorough, organized, and controlled
12. Diligent: Is persistent, hardworking
13. Sensitive: Shows tolerance, is tactful, and sympathetic
14. Empathetic: Understands others, identifies with others

Note. To view the full instrument, see Appendix A. (Northouse, 2019).

Phase 2: Skills Inventory

The next survey is the Skills Inventory Questionnaire. The participants will take the skills inventory designed to measure three broad types of leadership skills: technical, human, and conceptual. “This is a comprehensive skills model that is based on many empirical studies of leaders’ skills” (Northouse, 2019). A skills inventory will help the students in understanding how leadership skills are measured and provide the participants with a self-awareness of their own leadership competencies. The students responded to each of the statements in Table 3 and rated themselves for each skill using a 1-5 scale, where 1 meant

"strongly disagree" and 5 meant "strongly agree." Afterwards, they scored their own assessments using the scoring rubric to discover their technical, human, and conceptual skills.

Table 3

Northouse (2019) Skills Inventory

Skills Inventory

Instructions: Read each item carefully and decide whether the item describes you as a person. Please rate yourself for each trait (you can indicate by highlighting, or putting the number in bold, different color, etc.)

KEY: **1**= Not True **2**=Seldom True **3**=Occasionally True **4**=Somewhat True **5**=Very True

1. I enjoy getting into the details of how things work. _____
2. As a rule, adapting ideas to people's needs is easy for me. _____
3. I enjoy working with abstract ideas. _____
4. Technical things fascinate me. _____
5. Being able to understand others is the most important part of my work. _____
6. Seeing the big picture comes easy for me. _____
7. One of my skills is being good at making things work. _____
8. My main concern is to have a supportive communication climate. _____
9. I am intrigued by complex organizational problems. _____
10. Following directions and filling out forms comes easily for me.
11. Understanding the social fabric of the organization is important to me. _____
12. I would enjoy working out strategies for my organization's growth. _____
13. I am good at completing the things I have been assigned to do. _____
14. Getting all parties to work together is a challenge I enjoy. _____
15. Creating a mission statement is rewarding work. _____
16. I understand how to do the basic things required of me. _____
17. I am concerned with how my decisions affect the lives of others. _____
18. Thinking about organizational values and philosophy appeals to me. _____

SCORING:
Calculate the scores according to the scoring rubric. This will indicate if you are in the low, average, or high range to measure three broad types of leadership skills: technical, human, and conceptual.

Note. The scoring interpretations indicated if their skills for each category were in the low, middle, or high range for technical skills, human skills, and conceptual skills. To view

the entire measurement tool, see Appendix B. (Northouse, 2019).

Phase 3: Sulitest

The third questionnaire the participants were responsible for taking is the Sulitest. The Sulitest is a sustainability literacy exam meant to measure a person's content knowledge in sustainability. The Sulitest initiative was created to help higher education institutions, companies, and organizations around the world ensure their graduates, employees, stakeholders, and managers demonstrate core knowledge about the global sustainability challenges of the 21st century (Sulitest, 2016).

The creators of the Sulitest designed an initial platform to foster the mission to support expanded sustainability knowledge, skills and mindset that motivate individuals to become deeply committed to building a sustainable future and to making informed and effective decisions. "In 2013, universities were the first to begin to experiment with Sulitest's international tool through the pilot platform. It was also at this time that many regional committees were created and produced their first set of local questions. All of them were convinced, as much as we are, that in order to build a sustainable future, all current and future decision-makers urgently needed to improve their literacy on sustainable development" (Sulitest, 2016).

After the pilot phase, a new platform was launched in May 2016 at the UN Environment Assembly in Nairobi. "In this new Phase 1, the Sulitest presented a more user-friendly tool, both for users and for examiners, and questions built on a refined matrix and aligned with one or more of the 17 Sustainable Development Goals (SDGs) of the Global Agenda" (Sulitest, 2016). By 2016, the Sulitest was recognized as one of the first featured initiatives of the UN Partnerships for Sustainable Development Goals, and in 2017 as

a contributor to the review of the 2030 Agenda through the High-level Political Forum (HLPF).

According to the Sulitest team, "Universities need to demonstrate that all of their students share common sustainability knowledge and their basic understanding of the challenges. Everyone needs to go beyond greenwashing and to provide evidence of their commitments and impact measures for their stakeholders" (Sulitest, 2016). In the last few years, the Sulitest team decided to scale up its impact by setting the standard for universities and organizations. In 2022, Sulitest launched the first online certificate assessing sustainable development knowledge, that is accessible, easy to set up, reliable, and globally comparable. This knowledge standard allows students to be recognized for student employability and career development. This system also allows users to easily extract data and produce indicators and evidence, which can be used for rankings, accreditations, recruitment, among other things. "Our goal is to multiply our impact on the understanding of sustainable development by massively deploying the Awareness Test, aiming to reach 1 million tests per year worldwide and to reach the target of 500,000 certificates issued in five years. While these are just numbers, what motivates us to pursue this project is the massive impact the people behind those numbers can create when they are empowered with sustainability literacy" (Sulitest, 2016).

For the purpose of this study, the Sulitest was administered to the participants at CCU for the first time. Table 4 below contains three example questions and possible responses from the Sulitest (see Appendix C for full instrument).

Table 4

Sulitest: Measuring Sustainability Literacy

The Sulitest
1) In 2016, one third of the world's population was overweight and 13% obese. The sharp increase is particularly worrying among children, triggering diseases such diabetes or cardiovascular diseases. What are included in the behavioral patterns encouraged to prevent obesity?
A. Increase physical activity
B. Spend less time outdoors
C. Increase sugar and fat intake
D. Take more engine-driven transports E I'm not sure
2) Water is one of the fundamental supporters of life and a basic commodity for humankind. The water footprint measures the amount of water used to produce each of the goods and services we use. What is the global average water footprint for the production of a smartphone?
A. Approximately 13 liters
B. Approximately 130 liters
C. Approximately 1,300 liters
D. Approximately 13,000 liters
E. I'm not sure
3) The economic growth and human development that has occurred since the 1950s has induced a dramatic increase of the use of natural resources. Projected growth of population and human development requires adopting sustainable consumption and production patterns. What is the definition of Sustainable Consumption and Production (SCP)?
A. SCP is a holistic approach to minimizing the negative environmental impacts from consumption and production systems while promoting quality of life for all
B. SCP is an approach to improving the quality of life by accessing all available environmental resources
C. SCP is an approach to minimizing consumption while reducing production
D. SCP is an approach to minimizing consumption while increasing production
E. I'm not sure

Note. The full instrument can be viewed in Appendix C.

Qualitative Methods

The qualitative portion of this study included interviews with program participants to further investigate and develop a deeper understanding of participants' growth in leadership traits, leadership skills, and sustainability literacy. The program supervisors were interviewed asking similar questions based on their observations of the students. The second perspective allowed the researcher to understand the growth and development that occurred. In addition, the interviews provided further information on the type of learning the participants' experienced. The interrelationships that form from integrating the data provided a more holistic view of the influence of formal and informal learning experiences on overall leadership development. This is important because each of the programs experience different types of learning, which is illustrated in Table 5 below:

Table 5

Sustainability Groups: Formal or Informal Learning Experiences.

Sustainability Groups	Formal Education: (Sustainability Courses) Y/N	Experiential Learning
RCE Georgetown; Georgetown RISE	Yes- sustainability course	Individual Internships in Georgetown County and community involvement.
Solar Ambassadors	Yes- sustainability course	Land Use Project in campus housing at Coastal Carolina University
Sustain Coastal; Eco-Reps	No	Provides campus sustainability workshops. Provides civic group presentations to promote sustainability.
Sustain Coastal; Green Team	No	Collects campus recycling. Work special events on campus including athletics.

Phase 4: Interviews with Participants

The participants individually participated in a 15minute semi-structured interview with the researcher during a scheduled time either face-to-face, through Zoom, or over the phone. The researcher recorded the interviews electronically and by hand to ensure all information was included within the findings. The interview questions were developed and organized to provide a further analysis of the quantitative findings and support the research questions and purpose of the study. Each group had the majority of the same questions with individualized modifications as needed. An illustration of example questions from the semi-structured interview is represented below in Table 6.

Table 6

Participant Interview Questions

Which specific leadership traits do you feel have been improving or developing throughout the semester?
Which specific leadership skills do you feel have been improving or developing throughout the semester?
Did your leadership skills and traits develop more from formal learning (sustainability course/training) or through experiential learning (internships/projects/campus activities)?
How has your experiential learning directly contributed to the improvement or development of your personal leadership traits and skills?
How has your experiential learning supervisor contributed to your leadership development?
In what ways has the sustainability course been contributing to the improvement or the development of your leadership skills or traits as a sustainability leader?
In what ways has the sustainability course instructor been contributing to the improvement or development of your leadership traits or skills?
Do you feel you have a general knowledge and understanding of sustainability?
Do you feel you have a general understanding of the 17 SDGs?
Did your sustainability literacy improve more from the sustainability course or internship?
How has the sustainability course contributed to the content knowledge in sustainability?
How has the internship contributed to your content knowledge in sustainability?
Do you actively discuss or learn about the 17 SDGs during your internship?
Did you feel confident in your sustainability literacy after taking the Sulitest?
What areas of sustainability, specific SDGs or targets do you feel still need to be developed or do you want to learn more about?
Have you become more self-aware of your strengths and weaknesses as a sustainability leader from this semester?
In what ways do you plan to continue to improve and develop as a leader in sustainability?

Interviews with Supervisors

The last step in the qualitative process is to interview the program supervisors. The supervisor interviews are conducted the same way as the participants. The responses from program supervisors will further my understanding and provide a holistic view of the participants' leadership development throughout the course of the semester. The questions are slightly modified and are based on the observations and inferences they made from working directly with the participants. The interview questions for the program supervisors are represented in Table 7 below:

Table 7

Supervisor Interview Questions.

Which leadership traits and skills do you feel your students have developed throughout the semester?
How have your students grown in their sustainability literacy throughout the semester?
Do you intentionally implement leadership development strategies into your program?
For this current group of students what are their sustainability leadership strengths?
For this current group of students what are their sustainability leadership weaknesses?
Do you feel that leadership development is important for ESD and achieving Goal 4?
In the future, how would you like to see your students grow in their sustainability literacy?
How do you plan on increasing the leadership development of your students in the future?
How can the results of this study help you to develop your students as leaders in the future?
In the future, how would you like to see your students grow in their sustainability literacy?
Do you feel that leadership development is important for ESD and achieving Goal 4?

Integration of Qualitative and Quantitative Data

The qualitative data from the participants and supervisors was transcribed and coded to identify emerging themes. The final step of data collection included administering the post-questionnaires to the participants and analyzing the pre and post data. The quantitative and qualitative findings were integrated and analyzed. The results and interpretation of the findings are illustrated and discussed within Chapter 4.

Chapter 4: Data Analysis

The data analysis of the integrated mixed methods case study evaluation supports the purpose of the study and analyzes the leadership development of higher education students involved in sustainability programs. To increase the validity of the findings the researcher used multiple data collection methods to triangulate the findings including a Leadership Traits Questionnaire (LTQ), a Leadership Skills Inventory, and the Sulitest to assess sustainability literacy. Qualitative data included interviews from both the participants and their program supervisors. The sample included 40 undergraduate students from Coastal Carolina University involved in 1 of the 4 sustainability programs: RCE Georgetown, Solar Ambassadors, Eco-Reps, and Green Team. The findings of this mixed methods case study investigation provide a holistic understanding of the leadership growth and development of the higher education students that occurred as a result of participating in the sustainability programs. This chapter deliberates the research methods, the quantitative and qualitative data collection, and the findings of this study. The results explicate the alignment of the pre-questionnaires, post-questionnaires, and qualitative interviews to the purpose statement and research questions which justifies the researcher's decision for the type of study and applied methods. The analytical and conceptual process for this chapter begins with reintroducing the research questions, followed by participant information such as conditional factors, sample size, and a detailed description of the demographics. Next, the findings for each phase of the study are discussed beginning with a descriptive analysis of all 3 of the instruments used to generate the quantitative findings for phases 1-3. The fourth phase provides an in-depth illustration of the qualitative findings, and the last section concludes the analysis with a final summary interpreting the overall case study findings.

Research Questions

The purpose of the mixed methods case study analysis is to evaluate leadership growth and development of higher education students involved in sustainability programs. The researcher decided on the specific methodology to answer and support the 4 research questions:

RQ1. Which of the leadership traits did the students develop throughout the semester?

RQ2. Which of the leadership skills did the students develop throughout the semester?

RQ3. Was there growth in sustainability literacy from the beginning to the end of the semester?

RQ4. Was there overall growth in leadership development from the beginning to the end of the semester?

Research questions 1-3 were designed to be measured and analyzed separately for each individual group. The quantitative instrument to answer RQ1 was measured by using a Leadership Trait Questionnaire (LTQ). RQ2 was measured by using a Leadership Skills Inventory. RQ3 was measured by using the Sulitest, which is a sustainability literacy assessment. The data from each of the 3 instruments were analyzed, connections were made between the 3 sets of quantitative data, and inferences were made in support of RQ4. The qualitative phase of the data collection consisted of interview questions for all individual participants in each of the 4 groups. The interview consisted of specific leadership questions that would support RQ1 and RQ2, specific sustainability literacy questions in support of RQ3, and a few additional questions that integrated both in support of RQ4. The final

qualitative portion included interviews of each groups' supervisor to provide a deeper understanding through another perspective. Lastly, there is a complete evaluation of all mixed methods findings, and a final analysis of the leadership growth and development is concluded.

Conditional Factors of Participants:

The participants recruited to be in the study were undergraduate students from CCU. The only conditional factor was that they had to be involved in 1 of the 4 sustainability programs on campus including RCE Georgetown, Solar Ambassadors, Sustain Coastal Eco-Reps, and Sustain Coastal Green Team. The total number of student participants from all 4 higher education sustainability programs was 40. The specific number of participants from each group are included:

1. RCE Georgetown – 18
2. Solar Ambassadors – 12
3. Sustain Coastal Eco-Reps – 6
4. Sustain Coastal Green Team – 4

A detailed breakdown of the total number of students who participated in each of the quantitative and qualitative portion of the study is represented in Table 8. It is important to note that only 2 out of the 4 groups (RCE Georgetown and Solar Ambassadors) were expected to take both the pre and post-surveys. These 2 groups of participants both started in January 2022, which allowed the researcher to administer a pre-survey in January, and again mid-March to evaluate their growth and development. The researcher chose to have the Sustain Coastal students who were members of the Eco-Reps and Green Team only participate in the quantitative surveys once due to the various start dates among the students.

The Sustain Coastal Eco-Reps and the Green Team programs began in August of 2021, and the participants became members anywhere between August 2021 and January 2022. The researcher began the data collection of the quantitative data of the pre-surveys in January of 2022, and the 2 Sustain Coastal groups had already been running for a few months. Therefore, the researcher would have had to administer the pre-surveys at the beginning of their individual start dates to receive an accurate measurement of the pre and post data. Although the Sustain Coastal students only took the quantitative surveys once and did not participate in the post-data, the data collected was still important and contributed to the analysis to validate the findings. The quantitative data was supported by the qualitative findings from interviews with the individual participants, and interviews from their supervisors for all 4 of the groups. There were minor limitations because not all of the students participated in all phases of the study due to various reasons. This will be discussed further within this chapter as well as in Chapter 5. Table 8 displays the specific number of students from each group that participated in each phase of the study.

Table 8

Participant Completion of Each Phase

Groups	*n*	Completed Number of Surveys by Instrument						
		Pre-LTQ	Post-LTQ	Pre-Skills Inventory	Post-Skills Inventory	Pre-Sulitest	Post-Sulitest	Interviews
1.RCE Georgetown	18	18	18	18	18	15	13	18
2.Solar Ambassadors	12	12	10	11	6	4	1	4
3.Sustain Coastal Green Team	8	4	N/A	3	N/A	1	N/A	3
4. Sustain Coastal Eco-Reps	6	6	N/A	5	N/A	3	N/A	4

In addition, 4 groups' supervisors participated in interviews to gain another perspective of the participants' leadership growth and development. They were asked questions specific to all 4 research questions, based on their observations and experiences working directly with the participants throughout the semester. This provided a new lens, added value to the quantitative and qualitative measures, and further validated the findings from the participants.

Demographics of Participants

The data represents the demographics of the total sample size (N=40) who participated in the study. The 5 demographic sections included the participants age, gender, location of where they are from, their major, and the year of study. The average age across the sample of participants was 22.72 years. From the 40 student participants, 25 of them identified as female, 13 identified as male, and 2 identified as nonbinary. The students were

asked to provide the location of residency (permanent address) and 12 participants identified as South Carolina in-state, and 28 students identified as out-of-state. The 40 students were asked what major they were in for their undergraduate degree and their responses ranged across 17 different majors. It is important to note that 4 out of 40 students said they were a "double major," which means the total number of majors listed were 44. Lastly the students were asked what year of study they were currently in. Based on the responses, only 2 were first-year students, 6 were second-year students, 12 were third-year students, 18 were fourth-year students (which was the largest) and 2 were in their fifth year. Table 9 represents the overall demographics from all 5 categories for the entire sample.

Table 9

Participant Demographics

	RCE Georgetown	*Solar Ambassadors*	*Eco-Reps*	*Green Team*
	n	*n*	*n*	*n*
Age				
Mean	22	27	20	20
Gender				
Men	5	6	1	1
Women	13	6	3	3
Nonbinary	0	0	2	0
Residency Location				
In-state	7	3	1	1
Out-of-state	11	9	5	3
Different Majors	9	8	5	3
Year of Study				
1st-year	0	1	1	0
2nd-year	1	2	2	1
3rd-year	2	4	3	3
4th-year	14	4	0	0
5th-year	1	1	0	0
Total	18	12	6	4

Note. The different majors' data is represented in Table 10.

I found the number of different majors interesting because of the variation across programs of study. Although all of the students were involved in sustainability programs, only a small number of the students were actually majoring in sustainability and coastal resilience. The breakdown of different majors is illustrated in Table 10 below:

Table 10

Participant Majors

Major	*n*
Sustainability and Coastal Resilience	12
Marine Science	6
History and Anthropology	1
Communication	2
Marketing	2
Political Science	3
Engineering Science	2
Intelligence Security Studies	6
Public Health	2
exercise and sport science	1
Biology	1
Biochemistry	1
Accounting	1
Exercise and Sport Sciences	1
English Studies	1
BFA Theatre Design and Production	1
Psychology	1

The following sections provide a breakdown of the demographics for each of the individual groups including RCE Georgetown, Solar Ambassadors, Sustain Coastal Eco-Reps, and Sustain Coastal Green Team.

RCE Georgetown Demographics

The RCE Georgetown group consisted of 18 participants. Based on the 18 individual responses, 13 identified as being female and 5 identified as being male. The average age of participants from this group is 22.22 years. The students were asked their permanent residence, and their responses showed that 7 of the students were South Carolina residents, and 11 of the students were out-of-state. The students were asked to declare their current major at CCU, and it is important to know that between the 18 students, they declared 9 different majors. From the 18 participants, 14 were in their fourth year of study, 2 were in

their third year of study, 1 is in their second year of study, and there were no first-year participants in this group. Table 11 represents the demographics of the 5 categories for the participants involved in RCE Georgetown.

Table 11

RCE Georgetown Demographics.

	RCE Georgetown
	n
Age	
Mean	22
Gender	
Men	5
Women	13
Nonbinary	0
Residency Location	
In-state	7
Out-of-state	11
Different Majors	9
Year of Study	
1st-year	0
2nd-year	1
3rd-year	2
4th-year	14
5th-year	1
Total	18

Note. The different majors' data is represented in Table 12.

The majority of RCE Georgetown's participants were seniors, and their degree programs vary across 9 different majors throughout the class. The specific majors are identified in Table 12.

Table 12

RCE Georgetown Major Declaration

Major	*n*
Sustainability and Coastal Resilience	2
Marine Science	3
History and Anthropology	1
Communication	2
Marketing	2
Political Science	2
Engineering Science	1
Intelligence Security Studies	3
Public Health	2

Solar Ambassador Demographics

The average age of students was 26.54. The participants' years of study varied with 4 students in their fourth year, 4 students in their third year, 2 students in their second year, 1 in their first year, and 1 in their fifth year. The gender identity of the 12 solar ambassadors divided evenly with 6 identifying as female and 6 identifying as male. The participants' responses about their location of residency indicated that 3 were SC in-state residents, and 9 are out-of-state. From the 12 students enrolled as a Solar Ambassador, the responses regarding their program of study varied between 8 different majors. This information is represented in Table 13.

Table 13

Solar Ambassador Demographics

	n
Age	27
Mean	
Gender	6
Men	6
Women	0
Nonbinary	
Residency Location	3
In-state	9
Out-of-state	8
Different Majors	
Year of Study	1
1st-year	2
2nd-year	4
3rd-year	4
4th-year	1
5th-year	0
Total	12

Note. There were 2 students that declared 2 majors. All majors are listed in Table 14.

The Solar Ambassadors different majors are varied similar to the RCE Georgetown participants. Table 14 represents the 8 different majors the students are enrolled in.

Table 14

Solar Ambassadors Major Declaration.

Major	*n*
Sustainability and Coastal Resilience	6
Marine Science- 1	1
Biochemistry- 1	1
Accounting-1	1
Exercise and Sport Science-1	1
Political Science-1	1
Engineering Science-1	1
Intelligence Security Studies- 2	2

Sustain Coastal Green Team Demographics

This group had the smallest number of participants from the sample with only 4 participants or 10% of the *N*=40 population. The mean age of the 4 participants was 20.25. There were 3 students who identified as female and 1 student who identified as male. When the participants were asked about their residency, only 1 student indicated that they were an SC in-state resident, while the other 3 students indicated that they were out-of-state residents. Among the 4 students, they declared 3 different majors. There were 3 students in their third year of study, and only 1 student was in their second year of study. There were no first year, fourth year, or fifth year students within this group of participants. The following information is displayed in Table 15.

Table 15

Green Team Demographics

	Green Team
	n
Age	
Mean	20
Gender	
Men	1
Women	3
Nonbinary	0
Residency Location	
In-state	1
Out-of-state	3
Different Majors	3
Year of Study	
1st-year	0
2nd-year	1
3rd-year	3
4th-year	0
5th-year	0
Total	4

Note. The Green Team different majors are identified in Table 16.

The Green Team participants had only 4 participants; 2 participants' major was Sustainability and Coastal Resilience, and the other 2 were psychology, and Intelligence and Security Studies. This is displayed in Table 16.

Table 16

Green Team Major Declaration.

Major	*n*
Sustainability and Coastal Resilience	2
Psychology-1	1
Intelligence and Security Studies-1	1

Sustain Coastal Eco-Reps Demographics

The final group of participants represented in the study are the Sustain Coastal Eco-Reps. This group had 6 participants, and the average age was 19.60 years. From the 6 students, 3 identified as female, 1 identified as male, and 2 identified as nonbinary. Only 1 Eco-Rep participant indicated that they were an SC in-state resident, and 5 of the students said they are out-of-state residents. The participants' major of study varied, along with their year of study, indicating that 1 was in their first year, 2 were in their second year, and 3 participants were in their third year of study. The demographics across all 5 categories are presented in Table 17.

Table 17

Eco-Reps Demographics.

	Eco-Reps *n*
Age	
Mean	20
Gender	
Men	1
Women	3
Nonbinary	2
Residency Location	
In-state	1
Out-of-state	5
Different Majors	5
Year of Study	
1st-year	1
2nd-year	2
3rd-year	3
4th-year	0
5th-year	0
Total	6

Note. The different majors are listed in Table 18.

The 6 Eco-Reps participants range across 5 different majors represented in Table 18.

Table 18

Eco-Reps Major Declaration.

Major	*n*
Biology	1
Sustainability	2
Marine Science	2
English Studies	1
BFA Theatre Design and Production	1

Phase 1: Leadership Traits Questionnaire (LTQ) Findings

The first survey the researcher chose to use was the Leadership Traits Questionnaire (LTQ) to survey the participants because it is a measurement tool that focuses on the leader's

innate leadership traits. This survey was taken by the participants in January 2022 at the beginning of the semester. This leadership instrument allows the leader to evaluate their individual leadership characteristics which can be used to offer valuable information to the participants. Northouse (2019) explains the trait approach as the oldest leadership theory with over a century of research giving the trait approach credibility over other leadership theories. The trait approach highlights the leader component in the leadership process, which should be the first step in evaluating one's personal leadership effectiveness. Northouse (2020) has found that "[t]he trait approach is also used for personal awareness and development. By analyzing their own traits, they can assess their strengths and weaknesses and decide what areas they may want to work on to increase or develop their traits" (Northouse, 2019). This is one strategy that can help improve the participants' overall leadership effectiveness. All 4 groups in the study were asked to take the LTQ survey. The survey consists of 14 different leadership traits, and the participants had to rate them on a scale 1-5 (1= strongly disagree, 2= disagree, 3= neutral, 4= agree, and 5=strongly agree). The number of participants who completed the LTQ from RCE Georgetown was 18, which was the largest group. The second largest group was the Solar Ambassadors who had 12 students participate. The 2 Sustain Coastal Groups are smaller and only 6 Eco-Reps participated, and 4 Green Team members participated. The findings allowed me to see the differences in the raw data due to the nonexperiential research design, and the small sample size. According to Creswell (2015) it is typical to have nonexperimental research designs in the field of education that rely on collecting quantitative data such as surveys or observations. This type of design is different than experimental designs because the data is not manipulated by a variable. The 4 groups LTQ data was a baseline of their leadership

traits prior to the participation of being in the sustainability programs. For those reasons, I found it reliable to use the average mean and standard deviation. Table 19 lists each of the leadership traits from the LTQ, provides the average scores for each group, and displays the standard deviation to identify the amount of variation in the scores between the 4 groups.

Table 19

Leadership Traits Questionnaire (LTQ) Average Mean and Standard Deviation.

	RCE Georgetown n=18	*Solar Ambassadors n*=12	*CCU Eco-Reps n*=6	*CCU Green Team n*=4
Leadership Trait	Average Mean ± Std Dev			
Articulate	4.17 ± 0.71	4.17 ± 0.83	4.17 ± 0.41	4.75 ± 0.50
Perceptive	3.78 ± 0.65	3.42 ± 0.79	4.00 ± 0.63	3.50 ± 1.73
Self-confident	4.00 ± 0.84	4.17 ± 0.72	4.17 ± 0.75	3.75 ± 0.50
Self-assured	3.39 ± 1.04	3.42 ± 1.00	3.83 ± 0.98	3.50 ± 0.58
Persistent	3.56 ± 0.86	3.83 ± 0.83	4.33 ± 0.52	4.75 ± 0.50
Determined	3.78 ± 0.73	4.00 ± 1.04	4.17 ± 0.75	4.00 ± 0.82
Trustworthy	4.22 ± 0.65	4.25 ± 0.45	4.50 ± 0.84	4.75 ± 0.50
Dependable	4.22 ± 0.55	4.42 ± 0.90	4.33 ± 0.82	4.75 ± 0.50
Friendly	4.33 ± 0.77	4.25 ± 0.75	4.67 ± 0.52	4.75 ± 0.50
Outgoing	3.72 ± 1.18	3.83 ± 0.94	4.50 ± 0.84	4.50 ± 0.58
Conscientious	3.83 ± 0.51	4.17 ± 0.39	4.00 ± 1.26	4.00 ± 1.41
Diligent	4.11 ± 0.90	4.58 ± 0.51	4.67 ± 0.52	4.75 ± 0.50
Sensitive	3.94 ± 0.94	3.92 ± 0.90	4.33 ± 0.52	4.25 ± 0.96
Empathetic	4.28 ± 0.83	4.25 ± 0.62	4.67 ± 0.52	4.50 ± 1.00

After comparing the mean score of each of the 14 traits for each of the 4 groups, I calculated the average overall score of the traits for each group, which is listed below:

- RCE Georgetown – 3.95
- Solar Ambassadors – 4.05

- Eco-Reps – 4.31
- Green Team – 4.32

The mean score of all 4 groups was 4.15, indicating that overall, the participants agreed that they possess the leadership traits. The only individual group that did not was RCE Georgetown, however, their mean score was still close to a 4.00 with an average rating of 3.95. The group that demonstrates the highest self-ratings for the leadership traits were the Sustain Coastal Green Team with a score of 4.32, and the second highest score was the Eco-Reps who rated themselves an average of 4.31. Although the Green Team may have had the highest score, they also had the lowest number of participants which should be kept into consideration. Another thing to keep in mind is that the LTQ survey is meant to serve as a tool to help the participant identify their individual traits. It encourages reflection on their own leadership strengths and weaknesses in order to learn what areas of leadership they can improve upon. These findings could also be useful for the program supervisors as a baseline for students to understand what traits each of their students have as individual leaders, and to evaluate their group as a whole.

RCE Georgetown: Compare LTQ pre and post

As previously mentioned, RCE Georgetown and Solar Ambassadors were the only 2 groups who were asked to take the LTQ a second time to compare the pre-questionnaire and post-questionnaire results. These 2 groups began their programs at the same time in January 2022, whereas the Green Team and Eco-Reps had different start dates beginning in August 2021. To compare the pre and post surveys of RCE Georgetown, the data had to be aligned to compare only those students who took both parts. The post LTQ was administered in mid-March 2022, a little more than halfway into the spring semester. There were 17 participants

in the RCE Georgetown group who completed both the pre and post LTQ survey. Table 20 represents how many participants' scores increased, stayed the same, or decreased their scores for each trait.

Table 20

RCE Georgetown (LTQ) Pre and Post Comparison

Trait	Increased	Stayed	Decreased
Articulate	5	7	5
Perceptive	3	13	1
Self-confident	3	10	4
Self-assured	2	8	7
Persistent	6	7	4
Determined	4	11	2
Trustworthy	7	7	3
Dependable	3	11	3
Friendly	4	11	2
Outgoing	6	9	2
Conscientious	5	8	4
Diligent	5	9	3
Sensitive	6	9	2
Empathetic	5	9	3

The RCE Georgetown pre and post LTQ findings indicated that all 14 traits had at least 2 participants (minimally) increase their scores. The trait that had the most growth in their score was *trustworthy,* which 7 of the 17 participants scored higher on in the post LTQ than on the pre LTQ. As the table above shows, the majority of students rated themselves the same for all 14 traits, and very few decreased their rating for each trait. It is important to remember that on the pre LTQ the students rated themselves high, justifying why the scores

for the majority of the group stayed the same. As for the students who had decreasing scores, it is important to note that this is most likely due to the students developing a stronger self-awareness and being able to identify their strengths and weaknesses more accurately throughout the semester.

Solar Ambassadors- Compare LTQ pre and post

The Solar Ambassador group was scored the same way on the post-LTQ survey. To compare the pre and post surveys of the Solar Ambassadors, the data had to be aligned to compare only those students who took both parts. The post-survey for the Solar Ambassadors was also administered in mid-March 2022, slightly more than halfway into the spring semester. The Solar Ambassador group had 8 participants complete the pre and post LTQ. The table below represents how many participants' scores increased, stayed the same, or decreased their scores for each trait.

Table 21

Solar Ambassador (LTQ) Pre and Post Comparison

Trait	Increased	Stayed Same	Decreased
Articulate	1	3	4
Perceptive	3	4	1
Self-confident	2	2	4
Self-assured	2	4	2
Persistent	4	2	2
Determined	3	1	4
Trustworthy	1	3	4
Dependable	2	3	3
Friendly	0	6	2
Outgoing	2	4	2
Conscientious	1	4	3
Diligent	1	5	2
Sensitive	2	4	2
Empathetic	0	4	4

The post-LTQ indicated that only 12 of the 14 traits had at least 1 participant increase their score. The 2 traits that the participants either stayed the same or decreased their score was *friendly* and *empathetic*. One reason for this could be that the Solar Ambassadors scored high in the pre-LTQ with a score of 4.20 for both traits, which leaves a smaller margin of room for growth.

Phase 2: Leadership Skills Inventory Findings

Similar to the trait approach, Northouse (2019) explains the similarities and differences of the skills approach. Both of the theories have a leader-centered perspective on leadership. Northouse (2019) notes that "in the skills approach we shift our thinking from a focus on personality characteristics, which are usually viewed as innate and largely fixed, to an emphasis on skills and abilities that can be learned and developed. Although personality certainly plays an integral role in leadership, the skills approach suggests that knowledge and abilities are needed for effective leadership" (Northouse, 2019). Leadership skills are defined as the ability to use one's knowledge and competencies to accomplish a set of goals or objectives. The Skills Inventory is a leadership instrument that is a comprehensive skills model that is based on many empirical studies of leaders' skills (Northouse, 2019). The inventory provides the participants with a sense of what their individual skills might be. Northouse (2019) describes effective leadership as being dependent on 3 skills:

1. Technical Skills- knowledge about proficiency in a specific type of work, usually a hands-on activity. They may include specialized skills in a specific area, analytical ability, or the use of appropriate tools or techniques.
2. Human skills- otherwise known as "people skills" means having the knowledge about and ability to work with people. Human skills allow a leader to work effectively with others, cooperate with a team, and being able to see the perspectives of others.
3. Conceptual Skills- the ability to work with ideas and concepts. They allow a leader to create a vision, create a strategic plan, and see the overall goals of an organization.

Although it is always important for a leader to have all 3 skills, depending on their leadership role they may be dependent on 1 skill more than another. It is also typical for an individual to be stronger in 1 of the 3 areas. For this study, the participants in all 4 groups were asked to take the Skills Inventory. The survey consists of 18 different questions and the participants had to provide a rating on a scale 1-5 (1= Not true, 2= Seldom true, 3=Occasionally true, 4= Somewhat true and 5=Very true). The number of participants who completed the LTQ from RCE Georgetown was 18, which was the largest group. The second largest group was the Solar Ambassadors who had 11 students participate. Again, the 2 Sustain Coastal Groups were smaller with only 5 Eco-Reps participants, and 3 Green Team participants. Similar to the LTQ, I found it beneficial to analyze the average scores and standard deviations to identify the amount of variation in scores for each of the 3 types of leadership skills: technical, human, and conceptual. Table 22 below provides a comparison of the scores for each of the 4 groups.

Table 22

Skills Inventory Average Range

	RCE Georgetown *n*=18	Solar Ambassadors *n*=11	CCU Eco Reps *n*=5	CCU Green Team *n*=3
Skills		Avg Mean ± Std Dev		
Avg Technical Score	24.89 ± 2.40	26.45 ± 2.62	26.00 ± 1.87	27.33 ± 2.52
Avg Human Score	22.94 ± 3.75	22.55 ± 4.93	23.60 ± 1.67	25.67 ± 2.31
Avg Conceptual Score	22.22 ± 3.51	22.36 ± 4.03	22.60 ± 2.30	25.00 ± 4.36
Ranges: 23-30= high 14-22= moderate 6-13=low	Technical= high Human= moderate Conceptual= moderate	Technical= high Human= moderate Conceptual= moderate	Technical= high Human= high Conceptual= moderate	Technical= high Human= high Conceptual= high

The results indicated that all 4 groups had average scores that were in the high range for technical skills. For human skills, only the Green Team and the Eco-Reps had an average score that was in the high range, and RCE Georgetown and the Solar Ambassadors had average scores in the moderate range. This finding is interesting because both of the Sustain Coastal groups scored high. One reason could be that the 2 Sustain Coastal groups had started prior to January and had already been working with people through action-based learning experiences while performing their roles and responsibilities specific to Eco-Reps and Green Team. The conceptual skills had only 1 group score in the high range which was the Green Team. The other 3 groups (RCE Georgetown, Solar Ambassadors, and Eco-Reps) had an average score that was in the moderate range. The Green Team not only had scores in the high range for each type of skill, but they scored higher than the 3 other groups in all 3 types of skills: technical, human, and conceptual. Similar to the scores of the LTQ, it is important to keep in mind that this is also the group with the lowest number of participants.

RCE Georgetown: Compare Pre- and Post-Skills Inventory

Similar to the LTQ pre and post survey, RCE Georgetown and Solar Ambassadors were the only 2 groups who were asked to take the Skills Inventory a second time to compare the pre-questionnaire and post-questionnaire results. These 2 groups began their programs at the same time in January 2022, where the Green Team and Eco-Reps had different start dates beginning in August 2021. To compare the pre and post surveys of RCE Georgetown, the data had to be aligned to compare only those students who took both parts. The post-survey was administered in mid-March 2022, a little more than halfway into the spring semester. RCE Georgetown had 17 people complete both the pre and post LTQ

survey. The pre and post Skills Inventory average scores were compared. Table 23 represents how many participants increased, stayed the same, or decreased their average scores for each of the 3 types of skills.

Table 23

RCE Georgetown Skills Inventory Pre and Post Comparison

Skill	Increased	Stayed Same	Decreased
Technical Score	1	10	6
Human Score	5	12	0
Conceptual Score	1	13	3

The RCE Georgetown pre and post Skills Inventory results indicate that there was minimally 1 person that increased from each of the 3 skills categories. The majority of the participants in the study scored the same from the pre to the post in both the technical skill and the conceptual skill categories. Human skills had the largest increase with 5 students, and there were not any students that decreased. One reason for the significant increase in human skills from January to March 2022 is most likely due to the students spending 2 months in their internships where they are working with other people. The reason the majority of the students' scores stayed the same is because they already scored themselves high on the pre-survey, leaving less room for growth. Lastly, there was a decrease of scores in technical skills in 6 of the students. A potential reason for this could be that the students have become more aware of their strengths and weaknesses throughout the semester while working on specific tasks in their internships. This result would indicate that they are increasing their self-awareness which is important for leadership.

Solar Ambassadors: Compare Pre and Post Skills Inventory

The Solar Ambassador group was compared the same way as the RCE Georgetown group. To compare the pre and post surveys of the Solar Ambassadors, the data had to be aligned to compare only those students who took both the pre and post Skills Inventory. The Solar Ambassador group had only 5 participants complete the pre and post Skills Inventory. Table 24 represents how many participants' scores increased, stayed the same, or decreased their scores for each trait.

Table 24

Solar Ambassadors Skills Inventory Pre and Post Comparison

Skill	Increased	Stayed Same	Decreased
Technical Score	0	2	3
Human Score	1	4	0
Conceptual Score	1	3	1

The results of the Solar Ambassadors pre and post Skills Inventory demonstrate that there was an increase of 1 student for both the human skills and the conceptual skills. Additionally, for both of the human and conceptual skills, the majority of the participants scored themselves the same from the pre to the post. The only skill that did not have any students increase and 3 students decreased was in the technical skill. Subsequently, this may be similar to the RCE Georgetown group; as their self-awareness increased, they could score themselves more objectively regarding their technical strengths and weaknesses.

Phase 3 Sulitest Findings

The Sulitest is a global sustainability literacy exam. The Sulitest.org website advises that “for all HEIs, the Sulitest aims to provide an international and universal applicable knowledge assessment tool for the academic world” (Sulitest.org, 2016). The Sulitest is taken by the participants directly on the website at Sulitest.org. The system generates the questions, calculates the scores, and generates the findings. The participants each took the CORE International test which is a series of 30 multiple choice questions that involve a wide range of sustainability topics across all 17 of the SDGs. For this phase of the quantitative surveys, there was slightly less completion among the participants.

- RCE Georgetown – 15
- Solar Ambassadors – 4
- Sustain Coastal- Eco-Reps – 3
- Sustain Coastal- Green Team – 1

1. Each individual participant responds to all 30 questions. The system generates the scores in three different ways, which is directly stated, in the Sulitest.org website:
2. The scores are calculated as follows: 4 points for the expected answer, 1 point for "I'm not sure" - if the option was offered. The % represents the percentage of expected answers
3. Average % of expected answers

The scores of the 4 groups are represented in Table 25 under the Average Score and the Average Percent in the first 2 columns. The third column is the Global Average Percent and the Country Average Percent. Table 25 provides comparison of each group’s averages to the Global and Country averages.

Table 25

Sulitest Average Scores Across All Groups

Groups	Average Score	Average %	Global %	Country %
RCE Georgetown	75	60%	57%	77%
Solar Ambassadors	69	55%	57%	77%
CCU Eco Rep	64	52%	57%	77%
CCU Green Team	38	30%	57%	77%

As you can see, RCE Georgetown was the group that had the highest average score of 75 and the highest average percent of 60%. This was also greater than the Global average. The next highest scoring group was the Solar Ambassadors with an average score of 69 and an average percent of 55% which was just shy of the Global average which is 57%. The Eco-Reps had an average score of 64 with an average percent of 55%. This was only 5% under the global average. The Green Team scored the lowest with an average score of 38 or 30%.

The findings are interesting because the 2 groups that scored the highest (RCE Georgetown and Solar Ambassadors) both have formal learning as part of their program and participate in a sustainability course as well as their experiential learning through an internship or campus project. It would be expected for these 2 groups to score higher than the 2 Sustain Coastal groups because they do not have to take a sustainability course. Another reason for the lower scores in the Eco-Reps and Green Team could be due to the lower number of participants. For example, the Green Team only had 1 participant. If more participants would have completed the Sulitest the score may have gone up. One similarity across all 4 of the groups was that their average % each fell below the average Country % which is 77%.

The results provide a baseline of the sustainability literacy of all 4 groups of participants. It is important to understand that the higher education sustainability students who completed the test were not formally prepared before participating in this knowledge assessment. The results are meant to provide a general idea of their content knowledge in sustainability. Furthermore, sustainability is a large field and very broad which does not mean that the students who scored poorly do not have a general understanding of sustainability.

Sulitest: Pre and Post Score Comparison

A post-Sulitest was administered only for the RCE Georgetown and Solar Ambassadors. It is important to mention that unfortunately there were a lower number of participants in both the RCE Georgetown and Solar Ambassadors which could have impacted the scores. For the RCE Georgetown group, 13 participants who took the pre-Sulitest completed the post-Sulitest, and for the Solar Ambassadors group only 1 participant completed the post-Sulitest. The pre and post scores are represented in the table.

Table 26

Sulitest Pre and Post Comparison

Groups	Pre Avg-Score	Post Avg-Score	Pre Avg- %	Post Avg- %	Global %	Country %
RCE Georgetown	75	65	60%	53%	57%	77%
Solar Ambassadors	69	92	55%	77%	57%	77%

RCE Georgetown's average score went down 10 points with a score of 75 to 65 from the pre to the post Sulitest. The average percent of this group also went down 13% from 60% to 53% from the pre to the post Sulitest. The Solar Ambassadors only participant scored higher in the post Sulitest. The average score of this group increased from a 69 to a 92, and the average percent increased from a 55% to a 77%. As previously mentioned, it is still

undetermined if this is an accurate representation of growth in sustainability literacy. This also means I am unable to determine which group had more growth in sustainability literacy with the quantitative data alone. With the qualitative results in the next phase, I will have a better understanding. The post test is still beneficial because it provides me with insight for future implications. This will be further discussed later in chapter 5.

Phase 4: Participant Interviews

The first phase of the qualitative portion of the study involved interviewing the participants from each of the 4 groups about mid-way through the Spring semester. As the primary researcher, otherwise known as the primary instrument (Creswell, 2015) I used multiple approaches to assess the validity and reliability of the qualitative findings. To make sure the findings are reliable, Creswell (2015) suggests documenting the steps of the qualitative procedures used within the data collection of the case studies. The process of the data collection is listed below:

1. Participants signed informed consent to participate in interviews. The participants had full understanding that the interviews would be recorded both by hand and by video or voice recording.
2. During the interviews I read each question and I took notes of the participants' responses.
3. Following the interviews, I used member-checking to ensure that my records of their responses were accurate.
4. I transcribed all interviews to make sure my records were accurate and there were no mistakes
5. I hand-coded the interviews and developed the larger themes.

6. A cross-check of codes was performed by a colleague to ensure accuracy
7. The findings are recorded in the data analysis through figures, descriptions, and narratives of the participants

The interviews were recorded which allowed me to go back and listen to them to make sure all critical information was included. The last step I performed to validate the findings was by member-checking. Creswell (2018) explains member-checking as a frequently used strategy in which the investigator takes summaries of the findings back to the participants in the study and asks them whether the findings are an accurate reflection of their experiences. After completing the qualitative data collection, I transcribed the interviews and hand-coded the major themes that emerged in the examination. I had a peer cross-check the codes to ensure the accuracy. Lastly, I presented the findings in multiple ways that will provide accuracy across different strategies where the findings consistently demonstrate the validity and reliability of the methods and results.

Interview Questions for each group

The interview began with questions pertaining to the participant's leadership development. The next series of interview questions were in regard to the participants' content knowledge in sustainability literacy. Lastly, there were questions asked that interrelate both leadership development and sustainability that help support inferences made from the quantitative and qualitative findings. This completes the evaluation and provides a holistic view to gain a better understanding of the participants' overall development as a sustainability leader.

A core list of questions was developed for all 4 groups. A few questions were slightly modified based on each groups' unique circumstance. For example, internships are the

"experiential learning" that RCE Georgetown participants are involved in. However, for Solar Ambassadors, their "experiential learning" is a project, and for the Sustain Coastal Eco-Reps and Green Team, "experiential learning" involves various roles and campus activities. The questions asked during the interviews will be referenced to throughout Phase 4 in the qualitative findings. The core list of Questions (Q) is below:

Note. *Questions denotes a mild variation of wording among each group.

Q1: Which specific leadership traits do you feel have been improving or developing throughout the semester?

Q2: Which specific leadership skills do you feel have been improving or developing throughout the semester?

**Q3: Did your leadership skills and traits develop more from formal learning (sustainability course/training) or through experiential learning (internships/projects/campus activities)?*

**Q4: How has your experiential learning directly contributed to the improvement or development of your personal leadership traits and skills?*

**Q5: How has your experiential learning supervisor contributed to your overall leadership development?*

**Q6: In what ways has the sustainability course been contributing to the improvement or the development of your leadership skills or traits as a sustainability leader?*

**Q7: In what ways has the sustainability course instructor been contributing to the improvement or development of your leadership traits or skills?*

Q8: Do you feel you have a general knowledge and understanding of sustainability?

Q9: Do you feel you have a general understanding of the 17 SDGs?

**Q10: Did your sustainability literacy improve more from the sustainability course or internship?*

**Q11: How has the sustainability course contributed to the content knowledge in sustainability?*

**Q12: How has the internship contributed to your content knowledge in sustainability?*

**Q13: Do you actively discuss or learn about the 17 SDGs during your internship?*

Q14: Did you feel confident in your content knowledge of sustainable literacy after taking the Sulitest?

Q15: What areas of sustainability, specific SDGs or targets do you feel still need to be developed or do you want to learn more about?

Q16: Have you become more self-aware of your strengths and weaknesses as a sustainability leader from this semester?

Q17: In what ways do you plan to continue to improve and develop as a leader in sustainability?

Interview Questions for Supervisors

The program supervisors for each group participated in a semi-structured round of interview questions. The responses from the supervisors are used as an additional data collection to add value to the already valid quantitative and qualitative measures. The 4 supervisors interviewed are indicated below and will be referred to as their number throughout the findings. The list of supervisors that participated oversee and/or work directly with the student participants in some capacity, included:

- Supervisor 1- Supervises both RCE Georgetown and Solar Ambassadors
- Supervisor 2- Assistant Direct of Sustain Coastal (oversees both the Eco-Reps and Green Team)
- Supervisor 3- Direct supervisor for the Eco-Reps
- Supervisor 4- Direct supervisor for the Green Team

The supervisors' responses were added throughout the sections as I found appropriate and are used as additional support for specific findings. A similar core list of questions was

developed, and a few questions were slightly modified based on the unique circumstance for each of the groups.

Note. The supervisor questions will be differentiated from the student interviews by labeling each as Supervisor Questions (SQ) before stating the question.

SQ1: Which leadership traits do you feel your students have developed throughout the semester?

SQ2: Which leadership skills do you feel your students have developed throughout the semester?

SQ3: How have your students grown in their sustainability literacy throughout the semester?

SQ 4: Do you intentionally implement leadership development strategies into your program?

SQ5: For this current group of students what are their sustainability leadership strengths?

SQ6: For this current group of students what are their sustainability leadership weaknesses?

SQ7: Do you feel that leadership development is important for ESD and achieving Goal 4?

SQ8: In the future, how would you like to see your students grow in their sustainability literacy?

SQ9: How do you plan on increasing the overall leadership development of your students in the future?

SQ10: How can the results from this study help you as a supervisor to develop your students as leaders in the future?

SQ11: In the future, how would you like to see your students grow in their sustainability literacy?

SI Question 13: Do you feel that leadership development is important for ESD and achieving Goal 4?

Findings across all groups: Specific to Leadership Traits and Skills

The first two interview questions asked all 40 participants to identify the specific leadership traits and leadership skills they developed throughout the semester. After transcribing the interviews and coding the larger themes, I created a pivot table to illustrate the variation in responses along with the themes and sub-themes that emerged between all groups. Table 27 provides an illustration of the themes and sub-themes across all groups.

Table 27

Overall Qualitative Findings in Leadership Traits and Skills

THEME: Trait or Skill	**Sub-themes**	***(n)*= Students identified for each**
RCE Georgetown		
Confidence		**29**
	Self-Confidence	10
	Public Speaking	8
	Adaptable	2
	Class Participation	8
	Proactive	1
Professional Skills		**24**
	Research development	7
	Interview Skills	3
	On the job skills	1
	Creativity	4
	Presentation Skills	4
	Social Media Skills	2
	Technology Skills	2
	Writing	1
		7
	Systems Thinking	1
	Critical Thinking	2
	Problem Solving	4
Personal Accountability		**15**
	Independence	8
	Taking on more responsibilities	1
	Time Management	6
Communication		**19**
	Asking questions	2
	Professional Conversations	6

	Community Involvement	1
	Teamwork	5
	Delegating Tasks	2
	Giving and Receiving Feedback	3
	Relationship Building	
CCU Eco Rep		
Communication		**20**
	Intuitive to others	1
	Giving and Receiving Feedback	2
	Asking questions	**5**
Teamwork		7
	Collaboration	3
	Relationship Building	2
	Relationship Building	2
Personal Accountability		**6**
	Personal Responsibility	4
	Organizational Skills	1
	Resilient	1
Systems Thinking		**4**
	Fast thinking	2
	Quick Responses	2
Confidence		5
Solar Ambassadors		
Communication		**9**
	Working across generations	1
	Leading a group	2
	Teamwork	4
Confidence		**7**
	Conversations with peers	2
	Increased participation	3
Green Team		
Communication		1
	Professional Conversations	4
	Conversations with Peers	**6**
Confidence		2
	Speaking to peers	1
	Leading a group	**4**
Personal Accountability		**7**
	Organization skills	1
	Taking the Initiative	**2**
	Personal Responsibility	1
	Maturity	1
	Patience	1

The trait that was identified as improving across all 4 groups was *confidence*. Sub-themes that emerged as specific examples of growth in confidence included leaving one's *comfort zone*, and confidence in *public speaking.* This is illustrated in the examples of direct responses from the participants. Eco-Rep participant 2 said, "communication and confidence and seeing myself get through challenging things and accomplishing task." RCE Georgetown participant 14 said, "built confidence especially confidence in talking to new people."

The skill that was represented across all 4 groups was *communication.* A few subthemes that provided specific examples of communication were *professional conversations*, *sharing ideas,* and *collaboration*. RCE Georgetown participant 17 said, "communication skills have improved talking to people both online and in person." Green Team participant 3 said, "communicate with my supervisor and people around campus." Participant 3 from Solar Ambassadors said, "communicate with everyone in the class and make sure everyone is doing their jobs." Further validation of these findings emerged while interviewing the program supervisors. Supervisor 2 validates this further; "public speaking and level of comfort of putting themselves out there." The response from Supervisor 1 also supports this; "A big one has been communication, and public speaking. Finding the best ways to communicate the issues to their peers and faculty/staff that they encounter." The following sections will provide more details of the traits and skills that developed exclusively for each group.

RCE Georgetown: Questions Specific to Leadership Traits and Skills

There were 18 participants from RCE Georgetown who participated in the interview phase of the study. Q1 asked what specific leadership traits were developed or improved

throughout the semester. *Confidence* (as previously mentioned) was identified the most, followed by *personal accountability.* There were 3 sub-themes found relating to personal accountability including *independence, taking on more responsibilities,* and *time management.* For example, RCE Georgetown participant 1 demonstrated 2 of the sub-themes in their response; "becoming more independent and developing self-accountability.*"* Participant 14 had a very detailed response and represented all 3 sub-themes by saying "I think it dramatically improved my skills, time management, and responsibilities, and having qualities of a leader and having a real job. Taking initiative as a leader, doing things on my own." Another interesting theme that emerged was *systems thinking.* Supervisor 1 provided additional insight on this; "ability to think on a systems level which is important because I am able to integrate different types of sustainability challenges on the social and economic fronts."

Q2 asked the participants to discuss the specific leadership skills they felt have been improving or developing throughout the semester. The skill that emerged the most from the RCE Georgetown participants was *professional skills.* This was discussed by Supervisor 1; "the students are starting to ask questions in their internships and are able to relate their jobs to the function of the county. They are also more easily able to talk about issues and interact with their supervisors." The top 2 sub-themes were apparent from the responses including *research skills* and *presentation skills.* RCE Georgetown participant 18 said specifically "skills in archival research." Participant 8 provided specific experiences that developed her presentation skills; "I have to present in front of the planning committee and speak in front of government officials."

Now that the specific leadership traits and skills have been identified, it is important to understand how formal and informal learning impacted leadership growth. Q3-Q7 evaluates this further to provide a deeper understanding. Q3 asked the students to identify if their leadership development grew more as a result of the sustainability course or the internship. All 18 participants agreed that their internship experiences contributed more to their leadership development. Q4 asked the participants to describe how their internship directly contributed to their leadership growth. Based on their responses, one inference I made was that the internship positions were autonomous; allowing the students to work independently, take on new responsibilities, and have creative freedom which positively influenced their leadership growth. According to RCE Georgetown participant 6 "it is very hands off, so it is up to me to manage my time when I am there, which made me more self-reliant. It contributed to my personal traits, time management, and personal research in the office." Participant 9 had a similar response and said, "I think a lot of the assignments in my internship I have been given professional and creative liberties to trust me and know what I am doing, and that aspect is good." Several of the students expanded on this during their responses from Q5 regarding the influence of their internship supervisor on their leadership development.

Several responses are similar to RCE Georgetown. The top 3 themes that emerged were *modeling behavior*, *relationship building,* and *equity and inclusion.* Participant 2 said; "Since my supervisor is a manager, I have learned a lot from her." Participant 3 said, "she has been great, the number one person who has contributed to my growth. She has taken me under her wing. I have just been absorbing everything and anything. She is the president of the chamber, involved in so many projects, and brings me to meetings. I am learning a lot

from her leadership." Participant 4 had a similar response; "Susan and Justin are great at including us. They allow us to come to meetings, sit us down to ask our opinions and took notes, very hands on. They are great leaders, and as a leader I want to do that too. We are creating a bond which is valuable in the workplace and a positive relationship." The RCE Georgetown group indicated that their leadership grew as a result of their internship experience, however this does not mean that the sustainability course was not beneficial. This is illustrated and supported by the responses to the next questions.

Q6 asked the students to identify ways the sustainability course contributed to their leadership development. Several of the participants expressed that they were learning about leadership from the guest speakers and networking opportunities that were provided by being in the course. Leaders around the Georgetown County community within different fields often present to the course and having class discussions with the students. The response from participant 8 offered details in their response, "as far as leadership having the confidence because of what I am learning in the class and who I am networking with has given me the confidence to feel I can take the lead on things in the internship. I think it teaches me to think differently. The people we have had come in and speak in class sometimes it is broad and unrelated to mine and helps me think outside the box more." The participant responses demonstrated aspects of the course that contribute to their leadership growth. The course instructor was another key contributor to the participants' leadership development which is evident in the responses to Q7. All 18 participants inferred that the course instructor had a positive impact on the students' growth and development as a sustainability leader. The top 3 emergent themes were *models' leadership behavior, inspires and motivates,* and *provides leadership opportunities.* A great example is displayed in

participant 14's response; "Dr. Martin has contributed so much to my leadership development. Just the opportunity of the internship in general., but also seeing how she is goal driven, how impressive her portfolio must be, her positive attitude towards sustainability. Showing us how sustainability can be applied in any career or anything you do." Participant 9 responded similarly; "I would say she has been very supportive and is always ready to help me out and she is a good role model herself. She is always super eager, and you can tell she is very passionate about the field and her students." The next response from participant 15, demonstrates a variety of the instructor's effective leadership qualities; "by observing the way she carries herself, you can tell Dr. Martin is a strong leader, so I learn by watching her. She makes a positive and comfortable learning environment, is willing to help." Other students agreed with participant 16 stating; "she has contributed by giving me this opportunity because she saw potential in me. She is a great woman and being able to go to her when I have a problem is helpful because she always finds solutions. She gives me opportunity to reach my full potential." RCE Georgetown supervisor provides additional opportunities for her students. Examples are provided in her statement; "there is a number of community engagement activities that the students are doing that goes above and beyond that demonstrates their commitment to a more sustainable community." Other sub-themes such as *autonomy,* and *providing resources* were found in the responses regarding the course instructor and were similar to the participants' internships supervisors.

Solar Ambassador: Questions Specific to Leadership Traits and Skills

Solar Ambassadors had 4 participants complete the interview phase of the study. Q1 asked what specific leadership traits were developed or improved throughout the semester. *Confidence* (as previously mentioned) was the most frequent trait that emerged. The sub-

theme identified in 3 out of the 4 participants' responses indicated that an increase in confidence led to an *increase in participation.* This is supported in the response from Supervisor 1; "I have seen an increase in motivation with some of the students."

Next, the Solar Ambassador participants were asked to identify the specific leadership skills they have improved on or developed throughout the semester. The top skill that emerged from their responses was *communication* (as previously mentioned). The top sub-theme that emerged from communication skills was *teamwork.* Participant 2 said, "communicate with everyone in the class and make sure everyone is doing their jobs." Participant 3 said, "being able to work as a team." Similar to RCE Georgetown, the Solar Ambassadors indicated that their leadership developed more through their experiential learning than from their sustainability course. For this group, their experiential learning is the on-campus project. All 4 Solar Ambassadors agreed that the planning of their dorm room project contributed to their leadership traits and skills and feel that their leadership will continue to develop as they work on the project throughout the semester.

Supervisor 1 agreed in a detailed response. "I 100% believe that the energy efficiency project in the freshman residents halls will help students understand why use of energy and reducing it is important for climate change. They will make that a proposal as part of a project for next year which will help them grow tremendously and interact with their peers." This suggests that the Solar Ambassadors leadership increased more from the project over the course, however, there is still demonstrative evidence that the course has contributed to their leadership development in diverse ways.

Q4 asked the students to identify how the sustainability course contributed (if at all) to their growth as a leader. The Solar Ambassadors had less examples in comparison to RCE

Georgetown, however they also had less participants. Similar to the RCE Georgetown participants, a connection was made between applying the content knowledge they gained in the sustainability course and applying that to their project. Participant 1 said, "I think that the course will develop my leadership over time and help on the technical side." Participant 2 provided a direct example; "I know a lot more about sustainability and energy usage and the way we use energy in Horry County and electricity. I think this is more so developing my knowledge, but I am able to apply it to the project." The content of the course was not the only contributor of leadership development. The Solar Ambassadors accredited many aspects of their leadership growth to their course instructor. It is important to note that the instructor for the sustainability course is also the supervisor for Solar Ambassadors and RCE Georgetown. The responses resembled those of the RCE Georgetown participants. Participant 3 said, "She has allowed me to have freedom and autonomy, which has given me a sense of leadership and I feel like that has been one of the best things about being a lead solar ambassador." Participant 4 said, "Mutual respect, she sets high expectations, and leads by example."

Eco-Reps: Leadership Traits and Skills

The Sustain Coastal Eco-Reps had 5 students who participated in the interview phase of the study. The first question asked them to identify specific leadership traits that developed or improved throughout the semester, *confidence* (mentioned previously) was one of the top emergent themes. This is supported in the response from supervisor 2; "eco reps have gained confidence in communicating with people on campus in issues related to sustainability." Another interesting theme found was *systems thinking*. Sub-themes that were related to systems thinking were *fast thinking* and *quick responses.* Eco-Reps participant 5

provided an example of systems thinking and confidence; “thinking on your feet, respond and be willing to say I don’t know all the answers let me get back to you.” The next question asked the Eco-Reps to identify the specific leadership skills they improved or developed throughout the semester. Other than *communication* (as previously mentioned) the skill that emerged the most from the Eco-Reps participants *teamwork.* The top 2 sub-themes that emerged from teamwork were *collaboration* and *relationship building*. Participant 1 said, “There is a need to be a leader. We need to be able to talk to people on prince lawn and communicate.” Participant 2 provided a detailed response by saying, “The Eco-reps in general helped me with public speaking and communicating with others and not being afraid to strike up conversations on campus. This has helped me have a broad sense of having a leadership role. It also allowed me to work on my own projects but also come together as a team, collaborate, accept feedback, and also provide feedback.” Supervisor 3 had a comparable response; “finding the best ways to communicate the issues to their peers and faculty/staff that they encounter.” The Eco-Reps were asked if the traits and skills that developed were a result of formal learning or through action-based activities, despite the program not having a sustainability course.

The 5 Eco-Reps participants indicated that they do not have formal learning or training alluding that their leadership growth was a result of experiential learning. Participant 1 explained, “from my experience, we learned it as we went along, nothing formal.” Participant 2 had a similar response; “no specific leadership training but we learn as we go. The job itself has helped me develop leadership skills and traits, but no formal training.” Supervisor 3 provided the same information; We are trying to figure out educational

opportunities for them. Sometimes we expect them to educate others, but we need to train them to be able to do that."

The participants were asked to then describe how their involvement of Eco-Reps on-campus activities directly contributed to their leadership growth. One example was presented in the response from Eco-Reps participant 1; "The Eco-Reps in general helped me with public speaking and communicating with others and not being afraid to strike up conversations on campus." Participant 3 provided another example; "I feel like I have definitely improved on public speaking, but also during 1v1 conversations with students at our events." The students also inferred that their Eco-Reps supervisor is an effective leader and contributed to their leadership in their responses to Q5. According to participant 2, "she is a great leader and I have learned all of my skills from her." Participant 1 agrees; "Cassie is a good leader; she has a good handle on us and keeps us focused and supports us." Q6-Q7 were not asked because this group does not have a sustainability course.

Green Team: Leadership Traits and Skills

The Sustain Coastal Green Team had 4 students who participated in the interview phase of the study. The first 2 questions were asked the same way to this group as the previous 3 groups. They were asked to identify specific leadership traits that developed or improved throughout the semester, and *confidence* (as previously mentioned) was one of the top emergent themes. Following this was *personal accountability*. The 2 interesting sub-themes that were related to personal accountability are represented in the response of Green Team participant 2; "I have noticed that I take the initiative more on things instead of waiting to be told what to do. I have also matured in other ways outside of Green Team."

Supervisor 4 felt the same; “I have noticed that students are taking the initiative more instead of waiting to be told what to do.”

Q2 asked the Green Team to identify the specific leadership skills they felt have improved upon or developed throughout the semester. The skill that emerged the most and was mentioned earlier was *communication.* The top 2 sub-themes that emerged from conversations were *professional conversations* and *conversations with peers*. For example, participant 3 said “Being able to go with a group of people and mitigate and delegate. Work with people to get the most efficient job done.” The Green Team indicated that the leadership growth was a result of action-based activities, comparable to the Eco-Reps.

Q4 asked the participants to describe how the Green Team roles and on-campus activities contributed to the improvement or development of leadership traits and skills. The major theme from the responses indicated that their leadership growth occurred from *working with people.* This supports the quantitative data in the skills inventory which illustrated a high score in humanistic skills. Supervisor 4 described part of their job roles as “getting students to interact with their peers.” Additionally, all 3 of the participants contributed their leadership growth and development to their supervisor. The responses to Q5 indicate that the participants view their Green Team supervisor is an effective leader. Participant 2 said, “she is a great leader, she provides us with resources and models behavior. I really like Lanie because she is younger and knowledgeable. I call her a girl boss because she gets the job done. When I talk about communicating, I learned that from her, and I am able to relate to her. She is good at being a supervisor because she is motivating and makes us feel seen and appreciated.” Q6-Q7 were not asked because this group does not have a sustainability course.

Findings Across All Groups: Specific to Sustainability Literacy

The series of questions in the second half of the interview pertain to sustainability literacy. The questions in this portion of the interview support RQ3 to further investigate and support the quantitative Sulitest results. The purpose was to deepen the understanding of the participants' content knowledge and to evaluate the students' overall growth in sustainability literacy. After analyzing the qualitative data for this section, the results suggest that all groups experienced growth in sustainability literacy. However, the type of growth that occurred varies between each of the groups. An illustration of each individual group is displayed in the following sections.

RCE Georgetown: Specific to Sustainability Literacy

RCE Georgetown participants experience formal learning through a sustainability course. The first two questions (Q8 and Q9) start by asking if the students have a general knowledge and understanding of sustainability and the 17 SDGs. All 18 participants responded "yes" which can be expected due to their participation in the sustainability course. In response to Q3, 100% of the participants agreed that their content knowledge in sustainability improved more from the sustainability course when compared to the internship. Next, Q10 was asked to develop a better understanding of how the sustainability course contributed to the overall growth in sustainability. The RCE Georgetown responses provide specific details of the curriculum, classroom activities, and teaching strategies that directly impact their growth in sustainability literacy. Table 28 illustrates the main themes that were represented across the RCE Georgetown's responses.

Table 28

RCE Georgetown's Qualitative Findings in Sustainability Literacy

Row Labels	Frequency
RCE Georgetown	**22**
Sustainability Content Knowledge	**17**
Applies content in class to internship	11
Class Discussions	4
Class Readings	3
Networking opportunities / guest speakers	5
Professional Communication	1

The responses were not only interesting but impressive. I found the main theme to be not just a single variable but instead a concept. The students were already making connections between formal learning and applying that with action. Several of their responses indicated the interrelationship between learning content in their course and applying the information to their internships. Participant 3 said it well; "it brings it all around full circle. I wasn't very familiar with the SDGs before taking the class. Being able to dive into each one, has an impact in all that you do. The course helps you read into it a lot more than you originally would and connect dots" Participant 8 had another similar response; "I think it has given me a larger scope of things, providing me with the bigger picture. It is really nice to get out of the office and listen, talk, and communicate on the level putting it into a larger perspective." Another response demonstrates the interrelationship between formal learning and action-based learning; RCE Georgetown participant 1 said, "the intersectional aspect we have to incorporate the SDGs into the projects we are working on. We have to think about, how does this all connect." It is understood that the participants have increased their content knowledge of sustainability from the course. However, based on their responses from Q12 I learned that their internships contributed to learning directly and

indirectly through connections and application. Another connection was made from RCE Georgetown participant 2; “it has connected the content more and challenges me to apply what we learn in class into the store that I am interning at”. RCE Georgetown participant 8 said, “it has allowed me to see real world application. I take high impact theories, etc. and apply them to real world application such as my internship.” The participants responded similarly to Q13 when asked if they learn about SDGs during their internships. The overall consensus of the participants was that they do not learn about SDGs during their internships. However, several of the responses indicate that they will indirectly learn about the SDG that is specific to their internship. For example, RCE Georgetown participant 12 said, “I have been seeing how the SDGs are being played out within my internship”. Participant 13 said, “yes for the projects in my internship, and by applying the SDGs to my own research.” These responses demonstrate their connection between applying what they are learning through action.

The participants were asked if they felt confident after taking the Sulitest. The majority of the responses indicated that they felt confident to some degree; “Yes I felt confident, and I scored high,” says RCE Georgetown participant 12. On the other end, participant 9 said, “I felt fairly confident, but I wish I did better.” The final sustainability literacy question asked the students to identify the specific areas of sustainability, and/or the specific SDGs and targets that they would like to learn more about. The responses varied across the group, but after analyzing further I identified 3 themes for future learning. The most occurring response indicated that students wanted to learn more about the 17 SDGs in general. The second theme indicated that students want to learn specific aspects of sustainability relating to their current internship or field of study. An example is

demonstrated in the response from participant 5; “SDG 7 clean energy. I want to learn even more because that is what I want to do in the future.” The third theme indicates that the participants want to learn an area of sustainability that they know nothing about. Participant 18 says “I don’t really know much about infrastructure or the heavy accounting. I feel like with economic and sustainable development there is a big part that I don’t understand, and the statistics etc.” This information is beneficial and could be used to improve curriculum and instruction which will be further discussed in Chapter 5.

Solar Ambassadors: Specific to Sustainability Literacy

The Solar Ambassadors are all enrolled in a sustainability course similar to RCE Georgetown participants. This portion of the interview begins with Q8 and Q9 asking if the participants have a general knowledge and understanding of sustainability and the 17 SDGs. All 4 participants responded “yes” and agreed. This can be expected because this group is enrolled in a sustainability course. Q10 followed up by asking the participants if their sustainability literacy improved more from the course or the project. All Solar Ambassadors agreed that their content knowledge in sustainability improved more from the sustainability course when compared to the project. To expand on this, Q11 asked the Solar Ambassadors to discuss how the sustainability course contributed to their content knowledge in sustainability. The participants had varying responses, but each of the 4 demonstrate growth in sustainability content. Solar Ambassador, participant 4 said, “I would say the class has taught me everything that I know so far about sustainability. Before joining the Solar Ambassadors, I never heard of the SDGs and no knowledge about renewable energy. Participant 3 said, “the Solar Ambassadors have taught me an ample amount of information regarding solar but also sustainability.” Q12 and Q13 were not asked because this group

does not have internships. Q14 was asked in reference to their pre-Sulitest because only 1 student completed the post-Sulitest, which was after the time of the interview.

Q14 asked the participants how they felt after taking the Sulitest. All 4 responses indicated that they felt "pretty confident" after taking the Sulitest. This supports the quantitative data because this group scored the second highest of the 4 groups. When compared to the "Global percent," the Solar Ambassadors were also above average. The final sustainability literacy question asked the students to identify the specific areas of sustainability, and/or the specific SDGs and targets that they would like to learn more about. The majority of the participants expressed that they want to learn more about all of the SDGs. Specific areas of sustainability that they would like to continue learning were also provided. Participant 4 said, "I would like to learn more about energy because that is what I want to go into." Participant 2 said, "Yeah for sure we are definitely incorporating them into the project as far as marketing them into the project and to the students."

Eco-Reps: Specific to Sustainability Literacy

The Sustain Coastal Eco-Reps are not enrolled in a sustainability course, and do not participate in formal learning for sustainability literacy. This group learns the majority of their sustainability knowledge from experiential learning during their action-based on campus activities. The 5 Eco-Reps participants were asked in Q8 and Q9 if they had a general understanding of sustainability and the SDGs. The response was "yes" confirming that they all had a general understanding of sustainability and the SDGs. However, Eco-Rep participant 2 expanded on their response and said "yes, but I don't know as much as I would like." The next question had the same response among the participants as expected. Q10 followed asking the participants if their sustainability literacy improved more from the

course or the project. All of the responses confirmed that the Eco-Reps do not have a formal classroom or training, and they learn on the job during experiential learning. Q11 was not asked to this group because they do not have a sustainability course.

Q12 asked the participants to explain how their experience as an Eco-Rep contributed to their content knowledge in sustainability. The responses demonstrate that the participants are learning through action-based activities. Eco-Rep, Participant 3 said, "we learn mostly by doing. I also learned from a personal social media project. On Instagram "Players for the Planet" I was able to compare what their program was doing to the eco-reps. This helped me see where we have gaps and implement future initiatives." Participant 2 said "I feel like I wouldn't have dived so deep into sustainability if I wasn't in the Eco-Reps. I feel like it has allowed us to strive and bring our own initiatives to this campus on sustainability." And participant 1 said, "definitely going into the job there were times that I was figuring things out and learning. There are some things I would have to study up on to better understand and gain more knowledge. For the needs of the job I would need to learn more. There are plenty of opportunities to learn during the time in Eco-Reps."

In the following question, the participants were asked if they actively discuss or learn about the 17 SDGs during their activities in Eco-Reps. All 5 participants agreed that they do learn and discuss the SDGs during their experience as Eco-Reps. For example, Eco-Reps participant 1 said, "we definitely do the entire sustainability event was surrounding the 17 goals. We are coordinating the fair and tables into certain goals." Participant 4 provided great examples by saying, "Yes, so we recently did the SDG action awareness week that we participated in. I know for our Earth fair and our sustainability fair we try and connect the goals to an organization to represent each one of the goals and highlight the significance in

the local community." And participant 5 gave another example: "Yes and we try and relate all of our programs back to a sustainable development goal. During Earth month we will have an Earth fair on April 20, 2022."

The next question asked the participants to reflect on how they felt after taking the Sulitest. I expected the Eco-Reps responses to differ from the RCE Georgetown and Solar Ambassadors because they do not have a sustainability course and scored lower on the Sulitest. The Eco-Reps only took the pre-Sulitest which was previously mentioned and discussed further in limitations. Q14 asked the participants how they felt after taking the Sulitest. All 4 responses indicated that they did not feel as confident as the previous 2 groups. Specific examples from the 3 participations included Participant 1 saying, "no I did not know much." Participant 3 explained, "I was stressing the whole time I did not know anything; I knew about the topics but not the facts. Participant 3 said, "yes and no. I need to learn some more."

The final sustainability literacy question (Q15) asked the students to identify the specific areas of sustainability, and/or the specific SDGs and targets that they would like to learn more about. The group of Eco-Reps agreed that they wanted to continue learning about the entire field of sustainability, however they did provide specific examples. Participant 2 said, "Sustainable travel and transportation because I love traveling, and want to know how I can do this more sustainably in the future." Participant 3 said. "I would honestly like to learn about social justice and connect more with feminist and social justice type of topics and see if we can do more events related to that." And Participant 5 said, I would say more of the policy side of things because I don't know a whole lot about that."

Green Team: Specific to Sustainability Literacy

The Sustain Coastal Green Team participants are not enrolled in a sustainability course and do not participate in formal learning for sustainability literacy. The majority of their sustainability knowledge is learned directly during their Green Team experiences and action-based, on-campus activities. This portion of the interview began with Q8 and Q9, asking the participants if they have a general understanding of sustainability and the 17 SDGs. The response to Q8 was a unanimous "yes" confirming that they all had a general understanding of sustainability. In the responses for Q9, only 2 of the participants answered "yes" and 1 participant said "no". Q10 followed asking the participants if their sustainability literacy developed more from formal learning or experiential learning. All of the responses confirmed that the Green Team does not have a formal classroom or training, and they learn on the job during action-based, on-campus activities.

This is expressed directly in their responses: Participant 1 says, "More from campus projects we don't have formal learning." Participant 2 says, "Campus work because a lot of the people in green team are good influences and we have great discussions. I know how to compost my own food and bike to campus now." Participant 3 says, "definitely learn by doing our job roles for Green Team."

Q12 asks the participants to explain how their experience as a Green Team member contributed to their content knowledge in sustainability. The 3 responses varied, but all demonstrate that learning occurred through action-based activities. Participant 1 said, "I am aware of what can be recycled and what is not." Participant 2 said, "no, we don't talk about it in Green Team." Participant 3 said, "I learn on the job what I can do to help with campus impact". For example, reusable bags." This was an example of how the students are learning

through their action-based activities. Another example was provided by supervisor 2; “The Green Team understands zero waste; I have seen their knowledge being applied.” Supervisor 4 made another connection, “I think they understand sustainability and the implementation side of it.” The participants were asked if they actively discuss or learn about the 17 SDGs during their activities in Green Team. The group unanimously agreed that they do not discuss SDGs during their Green Team experience. This was the only group from the 4 indicating that they do not. This was confirmed in the response from supervisor 4; “we do not actively teach the SDGs. Green Team is very hands on, and that is where the students experience the most learning which is through action.” This was expected and confirms the low scores from the Sulitest in the quantitative data. The next question directly asks about the Sulitest and how they felt after taking it. The Green Team agreed again in their responses to Q14, indicating that they did not feel confident after taking the Sulitest as can be expected. The Green Team only took the pre-Sulitest which was previously mentioned and discussed further in limitations.

The final sustainability literacy question (Q15) asked the students to identify the specific areas of sustainability, and/or the specific SDGs and targets that they would like to learn more about. All participants indicated that they wanted to learn more about sustainability in general and the SDGs. Participant 1 from the Green Team added a specific example; “I want to learn more about the food wastes stuff. I saw the post of what Sustain Coastal does with Hicks.”

Integrate Leadership and Sustainability Literacy Questions

There were a few questions asked to the students and supervisors that connect leadership and sustainability literacy. This enhances my understanding of the participants overall growth as a sustainability leader. Q16 asks the students directly if they have become more self-aware of their strengths and weaknesses as a sustainability leader over the course of the semester. The responses from the participants in all 4 groups indicated that they have become more self-aware in their strengths and weaknesses throughout the semester. Improving self-awareness is an important trait of leadership. As the participants increased their self-awareness, they were able to reflect on their strengths and weakness more objectively. An example is given from Eco-Reps participant 5; "yes I would say I definitely learned where I was sort of lacking in my communication skills."

Once the students were able to identify their strengths and weaknesses, the next step would be to understand differentiating learning strategies that would enhance or improve their leadership. A response from RCE Georgetown participant 6 demonstrates this; "I am more aware of my weaknesses. As far as socializing goes, I was never outgoing, but now I am aware that communication is very important, so I need to work on those skills." Once this connection is made, they will be able to develop a plan and put it into action.

The final interrelated question asked the students to identify their plan of action to continue improving and developing as a leader in sustainability. The examples provided by the participants varied. For example, Eco-Reps participant 1 said, "in general working on time management and staying organized. To be a leader you need to be organized and I need to keep working on it in all areas." This was a notable example of self-reflection and how to continue improving in their everyday leadership traits and skills. Other students expand on

this and provide examples of how they will apply their sustainability leadership through knowledge and action. Green Team participant 2 said, “It’s more about spreading the knowledge that you have. Making people aware of their actions and what goes on.” RCE Georgetown participant 18 went into further details and said, “In sustainability I know the two things; educating and advocating as a leader to drive sustainability. Guiding and informing people about it is very important, whether in my major or church, and everyday life it is important and equivalent.” The responses illustrate the greater connection and importance of leadership development and ESD. The final question for the program supervisors was similar to gain another perspective and a holistic understanding. SQ10 asked the supervisors how they would like to see their students continue to develop as sustainability leaders.

The responses from the supervisors inform me as the researcher specific goals and outcomes that they would like to see in the future of their organizations. Specifically, this helps me understand the aspects of sustainability leadership that they would like to develop in their current and future students. The supervisors all indicated that they would like to see growth in sustainability content knowledge and in leadership skills, both individually within their own organizations, and also institutionally. Supervisor 1 said, “I would ideally like to have students at CCU take an intro to sustainability course. It’s a core class but not required. I think that, plus a more pervasive experience of Sustain Coastal and having it more a part of the culture will make students feel more comfortable with that type of thinking.” This information is considered for recommendations and will be further discussed in Chapter 5.

Summary

This chapter concludes by examining all quantitative and qualitative findings, bringing together a final interpretation of the data to complete the analysis. The findings determine the significance of the study by answering the research questions and support the purpose statement, illuminating the importance of leadership development on education for sustainable development. The triangulation includes quantitative and qualitative methods, confirming the validity and reliability of the data analysis. More specifically, multiple measures were used to analyze 3 elements of the study including leadership traits, leadership skills, and sustainability literacy. Another essential component to the study analyzed formal and informal learning activities. A final integration of all variables and outcomes were analyzed and interrelationships were formed. The investigation confirms that the participants experienced leadership growth and development as a result of participating in the sustainability programs. The case study evaluation was significant for this study to not only determine if there was growth, but to better understand the transformational learning that occurred throughout the semester. In conclusion, the findings provide a holistic view of leadership development on ESD. Key findings from the study will be discussed further in Chapter 5.

Chapter 5: Discussion

The purpose of this mixed methods case study analysis is to evaluate the leadership development of higher education students involved in ESD programs. By critically examining the leadership growth and development of students participating in different formal and informal ESD learning experiences, we can better understand the impact of leadership on ESD, which is necessary to create a more sustainable future. This chapter begins by revisiting the study background, methodology, and research questions, followed by an interpretation of the findings The research questions are supported with a discussion of the findings for each question. Implications are discussed in relation to this study, theory, and related fields. The limitations of the study are explained, followed by the direction for future research. The concluding chapter summarizes the study and the importance of leadership on ESD to contribute to the efforts in achieving the 2030 Agenda.

Study Background Revisited

The ESD for 2030 Framework was developed in the efforts to achieve Goal 4-quality education, and all 17 sustainable development goals. Leadership on ESD is essential for achieving the SDGs and requires a collective effort both locally and globally. Leadership on ESD is a more recent topic among researchers, but it is known that effective leadership has a collective impact across all multitudes of education for sustainable development. UNESCO (2017) explains that leadership on ESD involves a transformational pedagogy, incorporating curriculum and instruction, action-based activities, and connects formal and informal learning. Transformational leadership not only has positive impacts on organizational change but has demonstrated that it contributes to the leaders' personal growth (Notgrass, 2014). Higher education institutions all over the world are recognizing the

value of ESD programs and are implementing them into their institutions. The next step for HEIs is to understand the importance of leadership development on ESD, and the significant impact it will have on the effectiveness and success of change.

Research Design and Methodology Revisited

The mixed method case study evaluation critically analyzes leadership development in higher education students involved in sustainability programs. The unit of analysis is CCU. The participants were selected from purposeful sampling including 40 students across four sustainability groups; RCE Georgetown, Solar Ambassadors, Sustain Coastal Eco-Reps, and the Sustain Coastal Green Team. The duration of the study took place over the spring semester from January to April of 2022. The study was designed using an integrated data analysis and interpretation across multiple quantitative and qualitative measures. The procedure consisted of analyzing both sets of data separately, and then analyzing the combined data to generate interrelationships and create inferences. The triangulation of quantitative and qualitative measures increased the validity of the findings. The process to obtain the data included three measures of the quantitative data using the Leadership Traits Questionnaire (LTQ), Leadership Skills Inventory, and the Sulitest. The qualitative data included interviews with the participants, and interviews with their supervisors. The findings support the purpose of the study and research questions both individually and collectively, providing a holistic view of the leadership development that took place over the course of the semester. Inferences were made from the data analysis and provide implications for this study, and implications to similar fields. The limitations of the study were acknowledged and inform the researcher of a direction for future research.

Research Questions Revisited

RQ1. Which of the leadership traits did the students develop throughout the semester?

RQ2. Which of the leadership skills did the students develop throughout the semester?

RQ3. Was there growth in sustainability literacy from the beginning to the end of the semester?

RQ4. Was there overall growth in leadership development from the beginning to the end of the semester?

Interpretation of Findings

Leadership Traits

The first research question aimed to identify leadership traits that the participants improved or developed throughout the semester. The quantitative results for the pre-LTQ for all 40 participants were high in all 14 leadership traits. The mean score of all four groups was 4.15, indicating that all 40 participants agreed that they possess each of the leadership traits. A post-LTQ was taken by only two groups: RCE Georgetown and Solar Ambassadors. RCE Georgetown's post-LTQ findings demonstrated that all 14 traits had minimally 1 or more participants increase their scores from the pre to the post. The Solar Ambassadors pre to post LTQ data demonstrated growth in 12 of the 14 traits. The post-LTQ for both groups demonstrated that the majority stayed the same, and very few decreased for each trait. It is important to remember that on the pre LTQ the students rated themselves high, leaving little room for growth from the pre to the post.

The qualitative results from the interviews provide a more in-depth analysis of growth in leadership traits. The findings thematically demonstrated that *confidence* was the trait increased the most across all groups. An interesting sub-theme that emerged was *systems thinking*. This appeared through the discussions with both the participants and the program supervisors.

Implications

Northouse (2019) discusses the purpose of the LTQ as an implication to help the participant identify their individual traits and reflect on their own leadership strengths and weaknesses. This will benefit the participants by understanding the areas of leadership they can improve or develop. Northouse (2019) explains the Trait Theory as innate traits or characteristics that one possesses at an early age. Although many people will have the same traits over their lives, leadership traits can also change or develop over time. This theory supports the LTQ pre and post results by illustrating growth from some of the participants, and the majority of the participants rated themselves the same. There were a few participants who saw a decrease in their scores. This may indicate that they were increasing their self-awareness; a trait in leadership that develops over time. Participants who were developing their self-awareness may rate themselves more objectively in the post-LTQ, and rate themselves lower than in the pre-LTQ.

Phase four of the study included interviews with the participants and the program supervisors. The findings for the qualitative results demonstrate that all participants had increased their *confidence* as a result of participation in the sustainability programs. This informs the researcher that different types of learning both formally and informally may contribute to an increase in confidence which is a trait needed in leadership. A sub-theme

identified was s*ystems thinking,* which supports the literature of Mcnall et. al. (2015) describing the sustainability core learning meta-competencies in HEIs. *Systems-thinking* is one of the five key elements of the meta-competencies needed in higher education. "Systemic engagement allows students to expand their perceptions, and to consider the wholeness of a concept or a problem" (Mcnall et. al., (2015). This aligns with the SDGs conceptual framework which is presented as a systems-thinking model. This new approach has implications for universities and institutions in the success of change to achieve the SDGs.

Lastly, the integrated findings for leadership traits support the UNESCO (2017) learning objectives in the socio-emotional domain. This domain enables learners to promote the SDGs by developing self-reflection skills, values, attitudes, and motivations all of which are important traits and characteristics of leadership.

Recommendations for Action

The recommendations for action specific to leadership traits should be considered by all ESD programs in higher education. The recommendations for program supervisors and educational leaders will enhance understanding for this component of leadership development and positively impact leadership growth individually and institutionally. Recommendations for action are listed below:

- Provide a pre-LTQ for all students on their first day of an ESD program. Critically analyze their strengths and weaknesses and develop an action plan develop their areas of improvement.

- Program supervisors should utilize the pre-LTQ as the foundation to understand what areas of leadership traits need to be developed and implement formal and informal strategies to help grow their traits.
- Provide a pre-LTQ on the first day, and a post-LTQ on the last day of participation in each of the four groups.
- Use the LTQ for a longitudinal study for the participants who are part of one of the groups for more than one semester or year.
- Interview the participants in the beginning, middle, and end of the semester to truly understand at what point of the semester growth was occurring.
- Program supervisors should take the LTQ to understand their own leadership traits which directly impact the students within their programs.

Leadership Skills

The second research question aimed to identify leadership skills that the participants improved on or developed throughout the semester. This was supported by the second phase of the study which included a Leadership Skills Inventory. The results provided the participants with a sense of their strengths and weaknesses in all three areas of technical, humanistic, and conceptual skills. The results indicated that all four groups had average scores that were in the high range for technical skills. For human skills, only the Green Team and the Eco-Reps had an average score that was in the high range, while RCE Georgetown and the Solar Ambassadors had average scores in the moderate range for human skills.

Phase four of the study included interviews with the participants and the program supervisors. The skill that emerged among all groups was *communication,* demonstrating that this skill increased the most as a result of being in the sustainability programs. This

informed the researcher that different types of learning both formally and informally may contribute to an increase in communication. A few sub-themes that emerged from communication were demonstrated in the examples that the participants provided such as *conversations with peers* and *professionals*, *teamwork*, and *collaboration*. The participants were asked if these leadership skills were developed more from their experiential learning or their formal learning. All participants agreed that their action-based activities led to an increase of development in leadership skills.

Implications

The evidence from the findings builds on the theory of the skills approach (Northouse, 2019) placing more emphasis on leadership skills and abilities that can be learned and developed over time. The second phase of the study included the skills inventory, to provide the participants with a sense of their leadership skills. According to Northouse (2019), the Skills Inventory is a leadership instrument that is a comprehensive skills model that is based on many empirical studies of leaders' skills, including technical skills, humanistic skills, and conceptual skills. The evidence of the findings is in support of empirical studies. Northouse (2019) describes technical skills as proficiency in a specific type of work, usually a hands-on activity. This may include specialized skills in a specific area, analytical ability, or the use of appropriate tools or techniques. This would support why all four groups had a high technical score, because they all are involved in an action-based learning experience as part of their programs.

The results of the human skills are in support of Northouse (2019), describing them as "people skills", or having the knowledge about and ability to work with people. Human skills allow a leader to work effectively with others, cooperate with a team, and enable them

to see the perspectives of others. This explains why the two Sustain Coastal groups both had a higher baseline score for Human Skills. The two programs concentrate more on experiential learning through action-based and on-campus activities, requiring them to work directly with people. These two groups also began their participation in the Eco-Reps or Green Team prior to January 2022, giving them more experience than the RCE Georgetown and Solar Ambassadors. RCE Georgetown and Solar Ambassadors were the only two groups that were asked to take the post-Skills inventory. After analyzing the pre to post data, both groups increased their scores in human skills. This along with the qualitative data support evidence that their experiential learning positively impacted their human skills.

Lastly, this supports the behavioral domain of the UNESCO (2017) learning objectives. The behavioral domain includes action competencies and considers implications of experiential activities that lead to skill development. Additionally, for each SDG, indicative topics and pedagogical approaches are outlined.

Recommendations for Action

The recommendations for action specific to research of leadership skill development should be considered by all ESD programs in higher education. The recommendations should be considered to enhance the understanding of skill development and to apply the knowledge and implement best practices of formal and informal learning to increase the development of leadership skills.

- Program supervisors should administer a pre-Skills Inventory on the first day for all groups. This informs the program supervisors the baseline of leadership skills in the students individually and for the whole group.

- Provide a pre-Skills Inventory on the first day, and a post-Skills Inventory on the last day to fully analyze the skill development over the semester.
- Interview the students in the beginning, middle, and end of the semester to further understand how formal and informal learning experiences contribute to leadership skill development
- For RCE Georgetown, interview internship supervisors for another perspective of leadership development

Sustainability Literacy

The third research question aimed to determine growth in sustainability literacy. The findings included each group's average scores and average percent. The baseline data for the four groups after taking the pre-Sulitest indicated that RCE Georgetown scored the highest with a 75, the Solar Ambassadors scored the second highest with a 69, the Eco-Reps followed with a score of 64, and the Green Team score was a 38. The average percent across all four groups scored the highest to lowest in the same order, with RCE Georgetown scoring a 60%, Solar Ambassadors scoring a 55%, Eco-Reps scoring a 52%, and the Green Team scoring a 30%. The Sulitest.org compares each groups' average percent to the Global average and Country average. In comparison to the Global 57%, RCE Georgetown scored higher by 3%, and the Solar Ambassadors scored only 2% under the Global average. Eco-Reps scored only 5% under the Global average, and the Green Team was much lower. The Country average was higher than the Global average with 77%, and all groups were under this.

The only two groups who took the post-Sulitest were RCE Georgetown and the Solar Ambassadors. It is important to note that RCE Georgetown only had 13/15 participants take

the post-Sulitest and the Solar Ambassadors only had 1/5 take the post-Sulitest. RCE Georgetown's average score went down 10 points with a score of 75 to 65 from the pre to the post-Sulitest. The average percent of this group also went down 13% from 60% to 53% from the pre to the post Sulitest. The Solar Ambassadors only participant scored higher in the post-Sulitest. The average score of this group increased from a 69 to a 92, and the average percent of the group increased from a 55% to a 77%. The pre to post test was unable to determine growth due to the inconsistency across participation. The qualitative data was collected from interviews with both the participants and the supervisors, which provide a better illustration of growth in sustainability literacy during phase four of the study.

Phase four of the study included interview questions regarding the participants' content knowledge in sustainability. The participants from all four groups agreed that they have a general understanding of sustainability. Three of the four groups responded that they all have a general understanding of the SDGs, and the only group that disagreed was the Green Team. This was expected because the Green Team does not have a sustainability course, and they participate in less discussions regarding the SDGs in their roles as a member of the Green Team. This was supported by the Green Team supervisor who agreed that they do not discuss the SDGs during their on-campus activities. This was similar in the responses asking the participants if they felt confident after taking the Sulitest. The first three groups indicated that they felt confident to some degree, and the only group who did not was the Green Team. One other key finding from the interview indicated that all groups agreed that their experiential learning contributed to sustainability literacy to some degree, as they made connections and learned from action-based activities. A theme found from interviews

with the supervisors indicated that they each saw growth in sustainability literacy to some degree throughout their participation in their programs.

Implications

The data from quantitative and qualitative measures support the UNESCO (2017) learning objectives in the cognitive domain, comprising knowledge and thinking skills as necessary implications to better understand the SDGs and the challenges in achieving them. The qualitative findings demonstrated that all groups share a general understanding of sustainability, supporting of the mission of the creators of the Sulitest. According to the Sulitest team, "universities need to demonstrate that all of their students share common sustainability knowledge and their basic understanding of the challenges" (Sulitest.org, 2016). The baseline scores from the Sulitest were as expected. The two groups with the highest scores actively participated in formal learning through a sustainability course, and the two groups with the lower scores did not. This supports the need for formal learning in addition to experiential learning. The qualitative findings aligned with the quantitative results for the Green Team, who scored the lowest on the Sulitest. The Green Team was also the only group who indicated that they do not have a general understanding of the SDGs and they did not feel confident after taking the Sulitest.

Recommendations for Action

The recommendations for action specific to understanding and developing sustainability literacy should be considered by all ESD programs in higher education. The following recommendations could increase sustainability content knowledge within individual students, and collectively as an ESD program. This would lead to an increase in

sustainability content knowledge institutionally and will contribute to developing more sustainability leaders.

- Implementing formal learning opportunities for sustainability content for all ESD programs.
- Participants should take the Sulitest on their first day in their programs. The supervisor should analyze the results to better understand the students' baseline content knowledge in sustainability. This will inform their decisions of what content needs to be taught to fill the gaps.
- Administer the Sulitest to all groups on the first and last day within their programs to accurately measure the growth in sustainability literacy over the course of the semester.
- Institutionally, have all students take the Sulitest in their first year and again in their last year as a longitudinal study.

Leadership Development

Research question four aims to determine if there was overall growth in leadership development by integrating all quantitative and qualitative findings and analyzing all elements of the study. The multiple measures involved in the data collection including leadership traits, leadership skills, and sustainability literacy. The data was analyzed separately and together, forming connections and interrelationships from integrating the findings. Inferences were made from the interpretation of the final analysis in support of RQ4. The final evaluation provided evidence of overall growth in all three elements of leadership as a result of participating in the study. The findings indicating growth across all

groups were demonstrated in specific examples that emerged between the quantitative and qualitative data are listed:

- All participants indicated that they had a general understanding of sustainability
- All participants indicated that their program supervisors had a positive impact on their leadership growth
- All participants indicated that learning occurred through action-based activities
- All participants indicated that they developed communication skills
- The participants who had a sustainability course indicated that they applied their learned content knowledge to their experiential learning activities
- All participants agreed that by increasing their conceptual knowledge in sustainability it will grow their leadership.

Implications

The findings in support of RQ4 provide serious implications from the interrelationships that formed from integrating research questions 1-3. The interpretations from holistically analyzing the findings in all elements including leadership traits, leadership skills, and content knowledge in sustainability, demonstrated growth in overall leadership development from participation in the sustainability programs over the course of the semester. The inferences align with UNESCO (2017) learning objectives to cover the necessary learning outcomes including knowledge, skills, attitudes, and behavior to support the achievement of the SDGs.

Recommendations for Action

The recommendations for action should be considered by all ESD programs, not only in higher education but in all levels and learning environments. The findings of RQ4

demonstrate that learning and leadership are multifaceted and transformational. Educational leaders of sustainability programs should consider the following recommendations to evaluate their programs holistically. This will help them make informed decisions to improve their programs, develop stronger youth leaders, and increase the overall effectiveness of their ESD programs to achieve Goal 4.

- Sustainability leaders should evaluate their own leadership traits, skills, and sustainability literacy.
- Program supervisors and educational leaders should evaluate the leadership traits, skills, and sustainability literacy of their students individually and the group collectively
- Evaluate the program holistically to identify gaps and implement strategies of formal and informal learning.
- Intentionally implement opportunities for leadership development.
- Implement formal learning of sustainability content.

Summary of all Findings

The findings of the data analysis provided evidence for each of the research questions and supports the purpose of the study by illustrating the leadership development that occurred across all participants throughout the semester. The completion of the case study investigation evaluated the integration of all data. The following key findings emerged.

Key Findings

- The impact of leadership on ESD contributes to achieving Goal 4 and all SDGs.
- Leadership and learning are transformational across all formal and informal learning experiences.

- The program supervisors demonstrate transformational leadership and effectively contribute to the growth and development of their students' leadership
- Leadership traits, leadership skills, and sustainability literacy are all key elements in the overall growth of sustainability leaders.
- An interrelationship formed between the formal learning of sustainability literacy and informal learning through action-based activities.
- Increasing conceptual knowledge of sustainability contributes to the growth in leadership traits and skills.
- An increase in self-awareness allows the participants to assess their own strengths and weaknesses in all elements of leadership.

Implications of this Study

The implications from the overall study confirm that leadership on ESD is an important topic of research. The findings demonstrate the importance of effective leadership and the impact it has on achieving ESD. The idea that leadership and learning are transformational across many formal and informal experiences, provide implications that all elements individually and collectively influence the overall leadership development and the impact it has on education for sustainable development. The final analysis supports the UNESCO (2017) learning objectives for ESD by demonstrating learning in the cognitive, socio-emotional, and behavioral domains. The three domains of the learning objectives have serious implications to achieving the 2030 Agenda. The findings contribute to this field of research and demonstrate the importance of leadership on ESD. This study also supports the understanding of transformational leadership through multiple measures of quantitative and qualitative data. Transformational leadership is a leadership theory applied in related fields

similar to educational leadership and sustainability. Considerations from the implications in this study could benefit other fields and are discussed in the next section.

Implications for Related Fields

This study is significant because the findings support leadership development on ESD and can additionally benefit other fields. Leadership and sustainability are transferable and important across many fields as both individual concepts and integrated together as sustainability leadership. For example, The United Nations Global Compact (2018) has a blueprint for business leadership, which involves the enhancement of leadership to take action on achieving the SDGs. "Ultimately, the interconnectedness of the SDGs means that the leading company must adapt its business in all areas where it influences the 2030 Agenda" (United Nations Global Compact, 2018). Education and leadership are transformative across all disciplines, providing implications for informed decisions for individual and collective action to change our societies and care for the planet.

Limitations

The limitations of the study are identified and discussed as potential factors that may have influenced or impacted the direction of the research or results of the findings. A foreseeable limitation was due to the COVID-19 Global Pandemic that influenced the direction of the study. The pandemic created travel restrictions, time restraints, and limited resources which shifted my unit of analysis from multiple institutions to one institution which was Coastal Carolina University.

The other limitation was the timeline for data collection. For example, the decision to add the Sustain Coastal Eco-Reps and Green Team came after they had already started their programs. Their start date was discovered during the data collection, and each participant

had a different start date. Therefore, it was unnecessary to administer post-surveys for these two groups, as it would not have been a true representation of growth from pre to post. The second time restraint I was under contributed to my decision to collect the post-data in mid-March instead of waiting until the end of the semester.

A third limitation involved the inconsistency of participation. Not all of the participants completed all four phases of the data collection. This contributed to differences in sample size, therefore I was unable to analyze a true representation of growth from the pre to post data.

Direction for Further Research

The findings from this study inform recommendations for further research. To further the research of this study it is recommended to analyze all formal and informal learning strategies independently including pedagogy, curriculum and instruction, action-based activities, and community involvement to develop a deeper understanding of what influences leadership development. It is recommended for ESD program supervisors to modify or implement strategies based on the findings to improve the effectiveness of their programs. Another recommendation to further the study would be to conduct a longitudinal study and research the impact of the implemented or modified strategies on the programs in future years. Further studies could also include a single case study analysis of each program separately, to provide a more in-depth analysis of each individual program.

Future research for all ESD programs involves implementing or modifying the sustainability programs to include both formal and informal learning and measuring the impact on the program over time. This would include implementing both a sustainability course and action-based experiences into all sustainability programs. Institutional

recommendations for HEIs include implementing a sustainability course for all students at the university during their first year. Another recommendation would be to implement the Sulitest (or a similar sustainability literacy exam) and measure the students' content knowledge for the whole institution. Lastly, recommendations to create a new measurement tool to analyze leadership development on ESD by combining the multiple measures of leadership traits, leadership skills, and sustainability literacy. This would interconnect all components to create a new assessment tool and a new framework to measure the impact of leadership on ESD.

Conclusion

The case study analysis evaluates the leadership development of higher education students as a result of participating in ESD programs. The quantitative and qualitative findings were integrated, and the final analysis determined that there was an overall growth in leadership development for all four ESD programs. The study illustrates the interrelationship between all formal and informal learning experiences through a collective impact that illuminates the theory of transformational leadership and the influence it has on ESD. "Education for sustainable development is holistic and transformational education, which addresses learning content and outcomes, pedagogy, and the learning environment. It achieves its purpose by transforming society" (UN Secretary General, 2019). In conclusion, by developing more sustainability leaders, it will increase our effectiveness on ESD and achieving Goal 4. Quality education is central to the interconnection of all 17 SDGs and will lead to the achievement of the 2030 Agenda, and positively impact people and the planet for a more sustainable future.

Appendix A

Leadership Traits Questionnaire *

Instructions: The purpose of this questionnaire is to measure personal characteristics of leadership. Please rate yourself for each trait (you can indicate by highlighting, or putting the number in bold, different color, etc.)

KEY: **1**= Strongly Disagree **2**=Disagree **3**=Neutral **4**=Agree **5**=Strongly Agree

1.	Articulate: Communicates effectively with others	1 2 3 4 5
2.	Perceptive: is discerning and insightful	1 2 3 4 5
3.	Self-confident: Believes in himself/herself and his/her ability	1 2 3 4 5
4.	Self-assured: Is secure with self, free of doubts	1 2 3 4 5
5.	Persistent: Stays fixed on the goals, despite interference	1 2 3 4 5
6.	Determined: Takes a firm stand, acts with certainty	1 2 3 4 5
7.	Trustworthy: Is authentic and inspires confidence	1 2 3 4 5
8.	Dependable: Is consistent and reliable	1 2 3 4 5
9.	Friendly: Shows kindness and warmth	1 2 3 4 5
10.	Outgoing: Talks freely, gets along well with others	1 2 3 4 5
11.	Conscientious: Is thorough, organized, and controlled	1 2 3 4 5
12.	Diligent: Is persistent, hardworking	1 2 3 4 5
13.	Sensitive: Shows tolerance, is tactful, and sympathetic	1 2 3 4 5
14.	Empathetic: Understands others, identifies with others	1 2 3 4 5

* This questionnaire comes from Northouse (2019).

Appendix B

Skills Inventory *

Northouse, P. G. (2019). *Introduction to leadership: Concepts and practice.* SAGE Publications, Incorporated.

Instructions: Read each item carefully and decide whether the item describes you as a person. Please rate yourself for each trait (you can indicate by highlighting, or putting the number in bold, different color, etc.)
KEY: **1**= Not True **2**=Seldom True **3**=Occasionally True **4**=Somewhat True **5**=Very True

1. I enjoy getting into the details of how things work. _____
2. As a rule, adapting ideas to people's needs is easy for me. _____
3. I enjoy working with abstract ideas. _____
4. Technical things fascinate me. _____
5. Being able to understand others is the most important part of my work. _____
6. Seeing the big picture comes easy for me. _____
7. One of my skills is being good at making things work. _____
8. My main concern is to have a supportive communication climate. _____
9. I am intrigued by complex organizational problems. _____
10. Following directions and filling out forms comes easily for me.
11. Understanding the social fabric of the organization is important to me. _____
12. I would enjoy working out strategies for my organization's growth. _____
13. I am good at completing the things I have been assigned to do. _____
14. Getting all parties to work together is a challenge I enjoy. _____
15. Creating a mission statement is rewarding work. _____
16. I understand how to do the basic things required of me. _____
17. I am concerned with how my decisions affect the lives of others. _____
18. Thinking about organizational values and philosophy appeals to me. _____

SCORING:
The skills inventory is designed to measure three broad types of leadership skills: technical, human, and conceptual. Score the questionnaire by doing the following. First, sum the responses on items 1, 4, 7, 10, 13, and 16. This is your technical skill score. Second, sum the responses on items 2, 5, 8, 11, 14, & 17. This is your human skill score. Third, sum the responses on items 3, 6, 9, 12, 15, & 18. This is your conceptual skill score.
Total scores: Technical Skill_____ Human Skill____ Conceptual Skill____

Scoring interpretation:
23-30 High Range
14-22 Moderate Range
6-13 Low Range

* This tool comes from Northouse (2019).

Appendix C

Sulitest *

1) In 2016, one third of the world's population was overweight and 13% obese. The sharp increase is particularly worrying among children, triggering diseases such diabetes or cardiovascular diseases. What are included in the behavioral patterns encouraged to prevent obesity?

   A. Increase physical activity

   B. Spend less time outdoors

   C. Increase sugar and fat intake

   D. Take more engine-driven transports E I'm not sure

2) Water is one of the fundamental supporters of life and a basic commodity for humankind. The water footprint measures the amount of water used to produce each of the goods and services we use. What is the global average water footprint for the production of a smartphone?

   A. Approximately 13 liters

   B. Approximately 130 liters

   C. Approximately 1,300 liters

   D. Approximately 13,000 liters

   E. I'm not sure

3) The economic growth and human development that has occurred since the 1950s has induced a dramatic increase of the use of natural resources. Projected growth of population and human development requires adopting sustainable consumption and production patterns. What is the definition of Sustainable Consumption and Production (SCP)?

   A. SCP is a holistic approach to minimizing the negative environmental impacts from consumption and production systems while promoting quality of life for all

B. SCP is an approach to improving the quality of life by accessing all available environmental resources

C. SCP is an approach to minimizing consumption while reducing production

D. SCP is an approach to minimizing consumption while increasing production

E. I'm not sure

4) The objective of Biomimicry is to create new products, processes, or lifestyles compatible with life on earth in the long term. Among the following statements on Biomimicry, which one is NOT true?

A. Biomimicry can solve all problems, and all innovations inspired by nature are necessarily "good" for humanity
B. Biomimicry is based on the idea that nature has already solved most of the problems that humanity is facing.
C. Biomimicry is an approach to innovation that seeks sustainable solutions to human challenges by imitating the models and strategies experienced by nature.
D. Biomimicry, like industrial ecology, is already creating new opportunities for the eradication of poverty, green jobs and businesses.
E. I'm not sure

5) Universal health coverage is considered as "one of the most powerful social equalizers among all [health] policy options" (Dr Margaret Chan, former-WHO Director-General). It means people having… (select the appropriate statement)

A. … the same distance from medical facilities (hospital, doctors, paramedics, etc.) wherever they live.
B. … access to high-end prevention program introducing healthy habits.
C. … access to the health-care they need without suffering financial hardship.
D. … the same health conditions wherever they live.
E. I'm not sure

6) Since the beginning of the industrial revolution, oceans have absorbed a significant part of all CO2 released into the atmosphere by human activities, leading to an increased acidification of seawater. Thus, marine environment is currently exposed to a rate of acidification much faster than any time in the last 55 million years. How much faster?
   A. Acidification rate remains unchanged
   B. Approximately 2 times faster
   C. Approximately 10 times faster
   D. Approximately 100 times faster
   E. I'm not sure

7) In 2000, the number of out−of−school children and youth (including primary age, lower and upper secondary ages) was approximately 375 million. How many children and youth were out-of-school 14 years later (in 2014)?
   A. Approximately 600 million
   B. The number remained unchanged, e.g. approximately 375 million
   C. The number decreased to approximately 260 million
   D. The number decreased to approximately 60 million
   E. I'm not sure

8) Which of the following statements is NOT a correct description of Fair Trade?
   A. Fair Trade defines a trade partnership based on dialogue, transparency, respect and fairness in international trade.
   B. Fair Trade means changing practices in the supply chain, from production to the sale of the product.
   C. Fair Trade means paying wages from the developed world in the developing countries.
   D. Fair Trade is a tangible contribution to the fight against poverty, climate change and the economic crisis.

E. I'm not sure

9) Plastics are omnipresent in everyday life in modern societies. If plastic wastes are not properly controlled, they are transported into rivers or winds, and end up accumulating in the oceans. According to recent scientific studies, in a "business as usual" scenario regarding production and rejection of plastics, what is most likely to happen by 2050?
   A. Oceans are expected to contain more plastics than fish (by weight)
   B. Plastics will no longer be available due to crude oil shortage
   C. All plastics discarded in the environment will be dissolved
   D. All plastic garbage will be recycled
   E. I'm not sure

10) The internet and technology can provide transformational education and opportunities. Yet globally, a "digital gender gap" (difference between numbers of male and female internet users) is observed. What is the order of magnitude of the digital gender gap globally in 2016?
   A. About 53% more male
   B. About 12% more male
   C. About 53% more female
   D. About 12% more female
   E. I'm not sure

11) In November 2001, the General Conference of UNESCO adopted the Universal Declaration on Cultural Diversity. Which of the following is NOT a statement of belief of this declaration?
   A. Cultural diversity is as necessary for mankind as biodiversity is for nature.
   B. The process of globalization, facilitated by the rapid evolution of new information and communication technologies, while constituting a challenge for cultural diversity, creates the conditions for a renewed dialogue between cultures and civilizations.

C. In our increasingly diverse societies, it is essential to ensure harmonious interaction among people and groups with plural, varied and dynamic cultural identities as well as their willingness to live together.
D. In the best interest of individuals and of humanity as a whole, all peoples should adhere to a similar set of cultural norms in order to create a more harmonious global society.
E. I'm not sure

12) According to official 2015 United Nations population estimates and projections, what is the estimated population of Earth in 2050?
A. Around 11.7 billion people
B. Around 9.7 billion people
C. Around 7.7 billion people
D. Around 6.7 billion people
E. I'm not sure

13) “Carrying capacity" is the capacity of a system to support a population indefinitely with its resources. Currently the planet's carrying capacity is exceeded. Which of the following propositions would help moving towards a balance again?
A. Use available resources more efficiently and develop regenerative economic systems
B. Increase the amounts of resources available for everybody in the current economic system
C. Increase the size of the world's population
D. Nothing has to be done, nature balances itself out over time and will provide more resources for a higher population
E. I'm not sure

14) The investment sector is also changing with regard to sustainability. For example, BlackRock, the largest investor in the world, managing $6 trillion in assets in 2017, positioned itself recently. What message did the investment company pass on to the companies it holds shares in, thus embracing a global trend in the investment industry?
   A. Contribute to the acceleration of climate change, or risk loosing our support
   B. Stop investing in sustainability or risk loosing our support
   C. Emphasize shareholder value, or risk loosing our support
   D. Contribute to society, or risk loosing our support
   E. I'm not sure

15) The book "Kick the Habit: A UN Guide to Climate Neutrality" explains in practical terms how individuals, companies, corporations, cities and countries can start to change. Which of the statements below is NOT reflective of guide's recommendations?
   A. Addressing climate change is an opportunity we cannot fail to take. "So why not address it now? And if not here, where? If not now, when?"
   B. "Reducing financial institutions' travel or building-related emissions is their greatest influence. As a second and smaller step, they could also require climate-friendliness to the projects they lend to."
   C. "Local governments add to atmospheric damage when they design city centers to suit vehicles, not pedestrians, and buildings to the cheapest and not the highest standards."
   D. Everyone has the capacity to act. "Who should do it? Politicians? Absolutely. Business and industry? Certainly. Science and technology? Obviously. The United Nations? Of course. But if we really do want a changed world, it is useful to remember where to begin: be the change you want to see."
   E. I’m not sure

16) Most marine debris is made up of plastic, and its production and use is likely to continue to grow exponentially in the next few decades. Among the below, which

solution would have the most impact on reducing the presence of plastic on the marine environment?

A. Implementing responsible disposal policies of existing types of plastic, to prevent end-of-life materials from entering the marine environment
B. Preventing and reducing by design the production and consumption of environmentally persistent types of plastic such as PET
C. Increasing awareness and promoting population behavioral change, or giving consumers incentives to recycle persistent materials
D. Implementing all of the above strategies
E. I'm not sure

17) The Earth's ability to produce oxygen is at the basis of human life and of all other forms of life. Among the following elements, which produces the most oxygen?

A. Phytoplankton, unicellular plants in the ocean at the very bottom of the food chain.
B. The soil, with its multitude of micro-organisms and ability to capture and store carbon dioxide.
C. Humans and all other animals, as they release carbon dioxide composed in part of oxygen.
D. Forests, thanks to their trees and other plants.
E. I'm not sure

18) Cities worldwide are expected to concentrate more than two thirds of the world population in 2050. The density of cities and the pollution from individual vehicles has driven policy makers to think differently about mobility in urban areas. What is considered the most effective and realistic way to reduce overall pollution from individuals' mobility?

A. Replacing all cars by electric scooters.
B. Exchanging gasoline and fossil fuel powered cars by hybrid cars.
C. Using public transportation, bicycles, on foot mobility as much as possible.
D. Forcing companies to switch to teleworking for most of their activities.

E. I'm not sure

19) Putting a price on greenhouse gas emissions is considered one of the possible solutions to fighting climate change if correctly and massively implemented. Since the beginning of the 21st century, what has been the trend worldwide in implementing carbon pricing?
   A. Over forty countries and cities worldwide have implemented a carbon pricing mechanism, illustrating the political will and economic feasibility to do so.
   B. The World Trade Organization has decided to make mandatory for all member states the implementation of carbon pricing mechanisms in their economy by 2025.
   C. Because of its negative impacts on the economy, carbon pricing has not been implemented by more than a handful of governments.
   D. Because of the failure of the European Union's carbon cap and trade system to maintain a significantly high price on carbon emissions, no other countries have followed suit.
   E. I'm not sure

20) Which of the following 4 statements is NOT true?
   A. A Natural greenhouse effect already keeps the earth warmer than it would otherwise be
   B. Greenhouse gases resulting from human activities enhance the greenhouse effect, resulting on average in an additional warming of the earth's surface
   C. Greenhouse gases resulting from human activities are carbon dioxide, methane, chlorofluorocarbons (CFCs) and nitrous oxide
   D. The greenhouse effect is not enhanced by human activity
   E. I'm not sure

21) In 1972, the Club of Rome, a think tank of international scientists and economists, published a book entitled "The Limits to Growth". This book emphasized:
   A. The economic dangers of rising corruption

B. The economic dangers of the distribution of wealth
C. The ecological dangers of exponentially increasing pollution
D. The ecological dangers of economic and demographic growth
E. I'm not sure

22) According to recent studies, how does an adoption of such measures impact the company's long-term performance?
A. Very often these measures are costly and thus have a negative impact on the company's performance
B. The performance of a company is not impacted by such measures, they are simply “nice to have”
C. Companies adopting sustainability policies very likely have better financial performance over the long term than companies that do not
D. One cannot foresee how such measures can impact the company's performance
E. I'm not sure

23) For many years, the responsibility of higher education institutions for building a more sustainable world has been highlighted, as well as their role in educating about climate change and environmental protection. Faculty, administrators and students have developed initiatives, goodwill and positive energy at local and international levels. What trend is often observed?
A. Mandatory courses on energy, climate and sustainability are still very rare in higher education programs.
B. Higher education has treated sufficiently sustainability issues for a long time. The problem lies much more in lower education (high school, middle school, and grade school).
C. The Paris Agreement led to a tremendous increase is mandatory sustainability courses worldwide.
D. Higher education has covered issues of sustainability in a multi-disciplinary and exhaustive way since the industrial revolution.

E. I'm not sure

24) In 2012, how many people around the world were victims of forced labor?
   A. None, it is forbidden
   B. Approximately 2 million people
   C. Approximately 20 million people
   D. Approximately 200 million people
   E. I'm not sure

25) A complex system (a company, a city, an ecosystem ...) can operate important changes when acting on sensitive points called "leverage points". Among the 4 forms of leverage points below, which one is the easiest to trigger - but also the least effective for achieving systemic changes?
   A. Changing constants, parameters or numbers: for instance, change the value of standards on air pollution
   B. Modifying the rules of the system: for example, to set up a collective rating system rather than an individual notation.
   C. Modifying the structure of information flows: for example, installing an electric meter that is clearly visible to all -- and not hidden at the bottom of a closet.
   D. Changing the paradigm from which the system emerged: for example, when Copernicus and Kepler showed that the earth is not at the center of the Universe.
   E. I'm not sure

26) To understand how change is created, psychological science identifies 'contagious behavior,' defined as the unconscious transmission of actions or emotions from one individual to another. Which of the following statements does NOT apply to these 'contagious behavior'?
   A. Repeated exposure to the behavior of others helps to build scripts, or routines, which we then tend to perform in a particular situation.
   B. All individuals tend to be equal 'transmitters', and have the same ability to make you feel what they feel.

C. Rooted in biology and supported by social and situational factors, contagion is a powerful process and an almost inevitable fact of human beings.
D. We are often unaware of the influence that the emotions and behaviors of others have on ours.
E. I'm not sure

27) What is the meaning of the principle of accountability in a sustainability context?
A. Giving information to improve the reputation of an organization
B. Referring to the law in order to explain an organization policy
C. Being responsible for decisions, activities, and their consequences to the organization's governing bodies, legal authorities and, more broadly, its stakeholders
D. Being account officer for a firm
E. I'm not sure

28) The Ecological Footprint is a measurement method to evaluate whether the planet is sufficient to continue to support the demands of humanity. Among the following statements about Ecological Footprint, which one is FALSE?
A. Earth Overshoot Day indicates the date when humanity has exhausted the ecological budget of the planet for the year. It went from late September in 2000 to August 13th in 2015.
B. Moderate United Nations scenarios suggest that if current consumption and population trends continue, by 2030 humanity will need two planets to meet its needs.
C. If all people on the globe had the 2010 Footprint of the average resident of the nations with the highest per capita Ecological Footprint, humanity would require 4 to 5 planets.
D. Today, all countries use more resources than what is available in a renewable way within their own borders.
E. I'm not sure

29) According to UNESCO, Education for Sustainable Development (ESD) enables everyone to acquire the knowledge, skills, attitudes, and values needed to build a sustainable future. Among the following statements, which one correspond to UNESCO's recommendations on ESD?

A. A Teaching and learning should be interactive, in order to motivate students to change their own behaviors for sustainability.
B. Environmental, social and economic issues must be addressed separately and independently.
C. Teaching should focus only on the best students in each class so they can lead the way towards sustainability.
D. Programs should focus on standards and rules for sustainable development.
E. I'm not sure

30) How has the average proportion of women in parliament changed over the last 20 years in the 174 countries with reliable data?

A. A It decreased by 20%.
B. It remained identical.
C. It increased by 20%.
D. It almost doubled.
E. I'm not sure

*The Sulitest was originally published at Sulitest.org (2016).

Appendix D

IRB Approval

February 21, 2022

Michelle Dzurenda
Coastal Carolina University
Conway, SC 29528

RE: Leadership Development in Education for Sustainable Development; Evaluation of Higher Education Students

Michelle,

It has been determined that your protocol **#2022.112** is approved as **EXPEDITED** by the Coastal Carolina University Institutional Review Board (IRB) under the Federal Policy for the Protection of **Human Research Subjects Categories) #6 & 7**,

- #6 - Collection of data from voice, video, digital, or image recordings made for research purposes
- #7 – Research on individual or group characteristics, behavior, or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

This approval is good for one calendar year commencing with the date of approval and concludes on **2/20/2023**. If your work continues beyond this date, it will be necessary to seek a continuation from the IRB. If your work concludes prior to this date, please inform the IRB.

Approval of this protocol does not provide permission or consent for faculty, staff or students to use university communication channels for contacting or obtaining information from research subjects or participants. Faculty, staff and students are responsible for obtaining appropriate permission to use university communications to contact research participants. For use of university email to groups such as all faculty/staff or all students, requests should be made to the Provost's Office after the research protocol has been approved by the IRB. Please allow at least one week to receive approval.

Please note, it is the responsibility of the Principal Investigator to report immediately to the IRB any changes in procedures involving human subjects and any unexpected risks to human subjects, any detrimental effects to the rights or welfare of any human subjects participating in the project, giving names of persons, dates of occurrences, details of harmful effects, and any remedial actions. Such changes may affect the status of your approved research.

Be advised that study materials and documentation, including signed informed consent documents, must be retained for at least three (3) years after termination of the research and shall be accessible for purposes of audit.

If you have any questions concerning this review, please contact Patty Carter, IRB Coordinator, at pcarter@coastal.edu or extension 2978.

Thank you,

Stephanie Cassavaugh
Director, Office of Sponsored Programs and Research Services
IRB Administrator

cc: Anthony Setari

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