PENNSYLVANIA STATE UNIVERSITY
SCHREYER HONORS COLLEGE

THE SCHOOL OF ENGINEERING DESIGN AND INNOVATION

Leadership For Sustainable Development: Sustainable Competency Development

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SPRING 2023

A thesis
submitted in partial fulfillment
of the requirements
for a baccalaureate degree
in Biomedical Engineering
with honors in Engineering Leadership Development

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ABSTRACT

The United Nations outlined the 2030 Agenda for Sustainable Development to improve the environmental, social, and economic dimensions of the world. Specifically, the Agenda demanded lasting protection of the planet and its resources, peaceful societies that protect human rights, and sustained economic growth and prosperity. Even with a clear list of goals and a well-defined set of competencies that individuals should have to advance these goals, progress remains unhurried, only exacerbated by the pandemic and global conflict. Now, more than ever, leaders are needed to aid in the world's development towards sustainability. However, methods to introduce sustainability topics and develop related competencies are unclear, making it difficult to develop leaders with the skills to solve these challenges. In this study, an initial qualitative phase is used to uncover mechanisms contributing to participants' motivation to address sustainability issues, as well as their development of sustainable competencies. Then, a quantitative phase is used to identify and link specific factors contributing to competency development. The results suggest that personal experiences and background play a strong role in interest in sustainable development. Thus, leveraging personal motivations may improve competency development. Additionally, developed competencies were observable in a participant's problem-solving skills, suggesting a method to evaluate development of a specific competency. Finally, it was evident that leadership identity and the sustainable competencies were interrelated, emphasizing the importance of including leadership training alongside sustainability topics for successful competency development. It is anticipated that these findings will better equip educators and leadership trainers on methods to introduce and develop the personal competencies needed for progress in sustainable development.

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ACKNOWLEDGEMENTS

I would like to thank a handful of faculty, family members, and friends whose assistance and encouragement made the successful completion of my thesis possible.

Foremost, I would like the thank Dr. Park for his endless guidance and inspiration throughout the entirety of my research—including planning, collecting data, writing, and revising. I am incredibly grateful for the trust he has given me to carry out this research, as well as his willingness to answer any questions along the way.

Secondly, I would like to thank all of the participants that I have had the opportunity to interview for a part of the data collection towards this thesis. Their eagerness to share stories and perspectives undoubtedly made this research exciting and impactful.

I would also like to thank Paul Mittan for his insight and encouragement throughout the different checkpoints of my thesis. His excitement for my research fueled my eagerness to finish.

Lastly, I would like to thank my parents—Leslie and Joe—and my roommates—Loren, Christina, Alyssa, and Morgan—for their endless encouragement of my research and writing. They never hesitated to help me revise run-on sentences or pinpoint the exact word I was looking for. I am incredibly lucky to have been surrounded by such a supportive group of family and friends.

Introduction

Despite a growing concern for sustainability and a general consensus of its importance, progress towards achieving sustainable development remains unhurried. With the COVID-19 pandemic disrupting health services, aggravating poverty, interrupting supply-chains, and intensifying debt in developing countries, progress towards sustainability has been halted, and in some cases, entirely reversed (Fenner & Cernev, 2021). Though beginning to recover, the largest number of conflicts since the creation of the United Nations (UN) in 1945 is plaguing the world. More than two billion are living in affected countries; the highest number of refugees on record was reached in 2021. These conflicts, exacerbated by the war in Ukraine, have also put high stress on global trade and financial markets (UN, 2022).

Collectively, these situations have highlighted disparities and deepened pre-existing inequalities experienced by communities around the world. For example, economic differences have led to grossly unequal vaccine distributions, and disrupted financial markets have triggered steep undercuts of aid to those experiencing poverty (Stephens et al., 2020). Even more, droughts, floods, and extreme weather events have sharpened these problems, often deteriorating areas that are already being affected by other challenges. Now, more than ever, there is an urgent need to make changes that will aid in the world's development towards sustainability.

Fortunately, there is a clear list of goals outlined in the 2030 Agenda for Sustainable Development that, if achieved, can put the world on the path towards sustainability (Johnston, 2016). The Agenda also outlines competencies that individuals should possess to advance these goals. However, there still exists a highly controversial debate on which competencies are most

important, as well as the methods to instill these competencies in individuals (de Haan, 2010). Are certain people more likely to develop specific competencies? Does someone's background or previous knowledge impact the competencies they develop? Can an individual master one or two competencies, or must they have a deep understanding of them all to be successful? Without a clear understanding of competency development, it can be impossible to prepare individuals to make the changes that their communities so urgently need.

Since the challenges associated with sustainable development are complex and intertwined, some have found that educating on the topic independently can be overwhelming and disconnecting (McKeown, 2002). Sustainability concepts continue to evolve; there is no simple and unambiguous method to easily introduce the topic, making it challenging for educators to present material without confusing the learner. A key factor for successfully integrating sustainability-based education, noted by the United Nations Educational, Scientific and Cultural Organization (UNESCO), is also including the aspect of leadership (UNESCO, 2014).

Though many definitions exist, leadership is commonly understood as a force of influence resulting in change or outcome and uniting followers around a common goal (Sanders & Davey, 2011; Gemmil & Oakley, 1992). Since putting the world on the path of sustainable development is often described as a common goal that demands sweeping changes, strategic decision making, as well as one that requires us to act now and together, it is within logical reason that leadership is an important aspect of sustainable development (UN, 2019). It is believed that effective leadership is required to mobilize people towards a joint agenda, so fostering leaders with a vision of sustainable development may be key to reaching sustainability goals (Horlings & Padt, 2013).

This idea was implemented in the Strategic Leadership toward Sustainability (MSLS) program, a master's program at the Blekinge Institute of Technology (BTH) in Sweden. Missimer & Connell (2012) studied how certain learning methods were incorporated into the MSLS and if sustainability leadership skills were successfully developed by graduates of the program. It was uncovered that many of the students were able to build sustainability leadership skills, likely because of something the researchers say "sets the MSLS program apart from other programs related to sustainable development"—the addition of the leadership component in the program (Missimer & Connell, 2012).

Therefore, to better equip individuals with the sustainable competencies that allow them to reach sustainability goals, leadership education may be key. This concept, known by some as Leadership for Sustainable Development, suggests that leadership and sustainability topics should be introduced together, since each topic reinforces the other. Progress in sustainable development would greatly benefit from creative and visionary individuals who can facilitate collaboration among others—all of which are skills commonly attributed with effective leaders (Slimane, 2012). A handful of researchers have found connections between leadership and attainment of sustainable development, proposing that leadership approaches may allow individuals to make greater progress in economic growth and development in their countries (Darty-Baah, 2014). Still, there exists a disconnection in understanding exactly how leadership can be used develop certain competencies. In order to leverage leadership education to develop competencies needed for sustainable development, a first step may be to investigate the perceptions, knowledge, and interest of sustainability in leaders.

Research Rationale

Even with an understanding of key competencies that are needed to make progress towards sustainable development, there is still a lack of knowledge of how the specific competencies develop within individuals. The problem logic diagram, shown in Figure 1, elaborates on this idea and presents my key research questions.

Since the earliest understanding of sustainable development, there was a recognized importance of sharing knowledge and equipping people with innovative skills to face these new challenges. As this idea gained significance, a greater focus was placed on sustainability education. It was hoped that education could provide learners with the problem-solving skills and knowledge necessary to solve sustainability challenges. However, little evidence showed that education for sustainable development led to significant behavior change, likely because of the lack of a universal framework or set of standards. This raised awareness to the importance of developing a framework or set of skills that students should possess.

With the creation of the 2030 Agenda for Sustainable Development, 8 competencies were acknowledged as key skills for individuals wishing to solve sustainability challenges. The competencies were well researched, and specific goals were set to improve the environmental, social, and economic pillars of the world. However, there is still a gap in the understanding of *how* individuals develop these competencies and the best methods to introduce them. Additionally, limited investigations have examined young leaders pursuing sustainable development regarding their interests, previous knowledge, and motivations.

This study aims to understand participants' knowledge and interest in sustainable development and the 8 sustainable competencies. Through quantitative and qualitative study, I hope to connect participants' knowledge and interest, as well as their leadership identity, with

motivations to reach sustainability goals and development of the sustainable competencies. By connecting participants' conception of sustainability and current efforts in sustainable development, I hope to uncover methods to embed sustainability into leadership education for sustainable development.

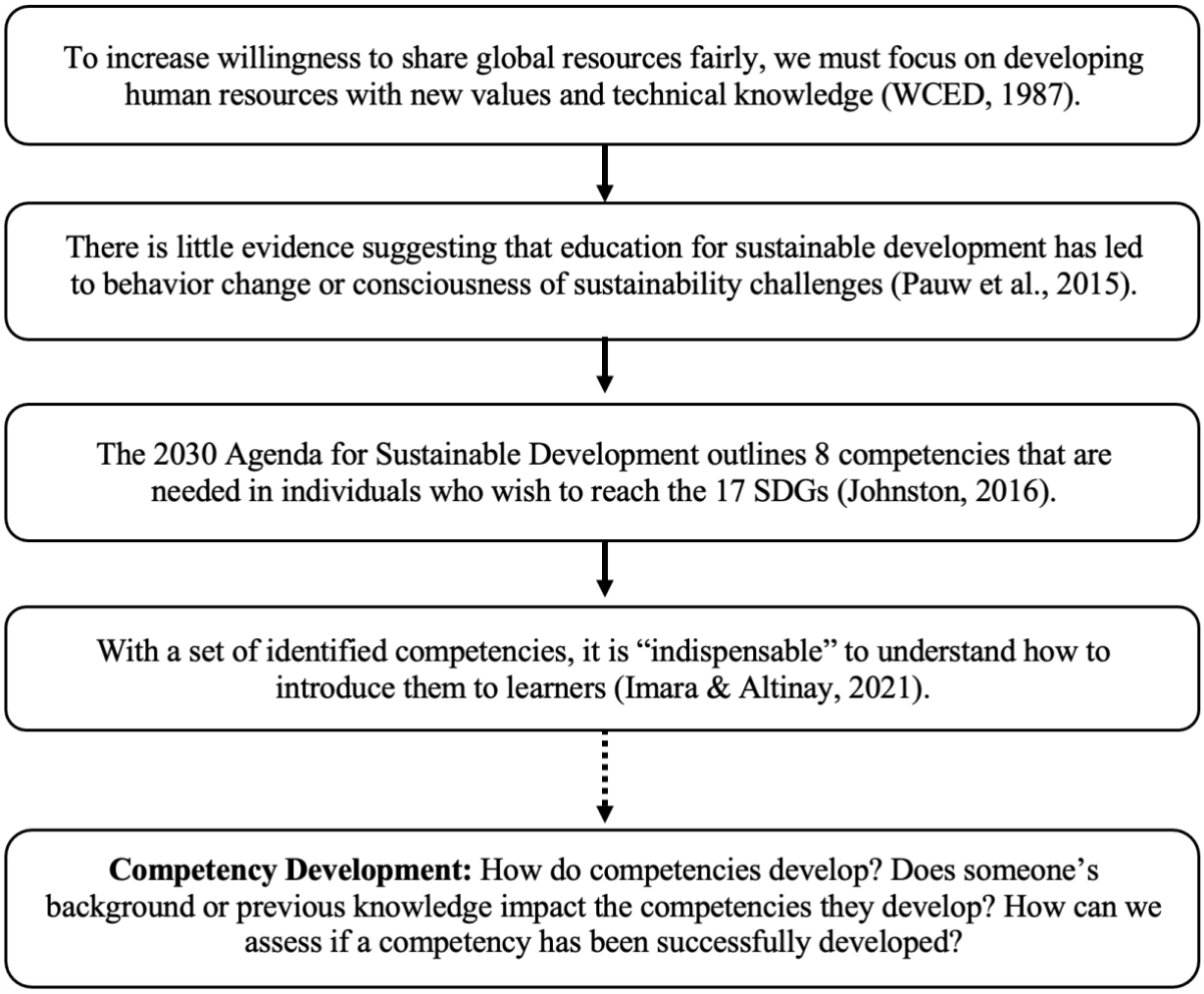

Figure 1. Problem Logic Diagram

Literature Review

Sustainable Development

As early as the term sustainable development was established, leaders have attempted to curate a definition that encompasses the idea and communicates its gravity. In 1987, the World Commission on Environment and Development (WCED) defined sustainable development as meeting the needs of the present without compromising future generations' abilities to do the same. They explained that meeting humans' collective needs and aspirations are imperative and stressed that it is a common interest because there are no set boundaries for ecological interactions (WCED, 1987). Their strategy to reorient the world onto the paths of sustainable development relied heavily on the implementation of vaguely described "policy changes" in all countries.

Nearly thirty years later, in an attempt to provide a more concrete definition and implementation strategy, the UN released the 2030 Agenda for Sustainable Development. In this agenda, sustainable development was characterized by the economic, social, and environmental dimensions (Johnston, 2016). That is, to achieve sustainability, we must reach sustained economic growth and decent work and prosperity for all (economic), create peaceful and inclusive societies that protect human rights and promote gender equality (social), and ensure lasting protection of the planet and its resources (environmental). To balance these dimensions, 17 goals and 169 targets were set. The 17 Sustainable Development Goals (SDGs) range from eradicating poverty and hunger, to developing means for sustainable production and consumption, and to achieving gender equality and economic resiliency (Sachs, 2012). Similar to the earliest sustainable development objectives, the agenda also recognized that reaching these

goals would be nearly impossible without collective action. Rather than simply calling for policy change, the agenda's 17th goal was entirely focused on a means of implementation. This goal called importance to strengthening finance, enhancing technology, building capacity, and promoting trade in all countries to prepare for implementation of the 17 SDGs (Schwan, 2019). It prioritized a global indicator framework for monitoring progress towards the goals and reaffirmed the importance of a strengthened and improved global partnership.

Even with a comprehensive set of goals and standards, the 2022 SDG Report revealed that the Agenda for Sustainable Development and its 17 Goals are unlikely to be achieved, largely because of multiple cascading crises. The COVID-19 pandemic has put close to 24 million learners at risk of not returning to school and reversed more than four years of progress on poverty elimination (UN, 2022). The war in Ukraine has disrupted global trade and supply chains, fueled the threat of a global food crisis, and forcibly displaced millions of people from their homes (Pereira et al., 2022). Though these and other crises have significantly slowed progress, similar trends were observed in SDG Reports before the onset of the pandemic. The 2019 SDG Report indicated that biodiversity loss was accelerating, more than half of children and adolescents were not achieving minimum reading and math proficiency rates, outbreaks of tuberculosis, measles, and other tropical diseases were rising in prevalence, and industrialization in least developed countries was still too slow to meet the 2030 target (UN, 2019).

These trends, and results of multiple crises, have put the Agenda for Sustainable Development in grave jeopardy. In order to put the world back on track and repair progress towards sustainability, the UN has called for rapid and collaborative action on a global scale. Fortunately, the Agenda provides a robust foundation with clearly outlined goals and targets.

This means that our end goal is defined; but we now must put all focus into the steps needed to reach this end goal.

Education for Sustainable Development

Years before the 17 SDGs were released, UNESCO recognized the importance of strengthening existing education practices, training systems, and general awareness about sustainability. Education for Sustainable Development (ESD) was introduced in 1992 with the goal of empowering individuals with the knowledge to address the complex, interconnected challenges facing the world (Rauch, 2002). Rather than design an entirely new discipline, ESD was presented as a way to reorient existing education to provide opportunities for learners to build the necessary skills, values, and attitudes to create a more sustainable society. UNESCO stated,

> *Education for Sustainable Development means including key sustainable development issues into teaching and learning; for example, climate change, disaster risk reduction, biodiversity, poverty reduction, and sustainable consumption. It also requires participatory teaching and learning methods that motivate and empower learners to change their behavior and take action for sustainable development. Education for Sustainable Development consequently promotes competencies like critical thinking, imagining future scenarios and making decisions in a collaborative way* (UNESCO, 2012).

Further, ESD carries with it the inherent idea that programs will take many different forms around the world. In order to remain relevant and engaging, all programs should take into consideration the local environmental, economic, and societal conditions. In the initial stages of implementation, ESD prioritized four components, including (1) improving basic education, (2) reorienting existing education to address sustainable development, (3) developing public

understanding, and (4) training (McKeown, 2002). A key concept emphasized throughout implementation was the importance of reorienting education to address locally relevant topics. It was explained that ESD curriculums could not practically teach all issues associated with sustainability, so communities should focus on a select group of relevant challenges within the three pillars of sustainable development–environment, economy, and society.

Besides selecting the appropriate content to reorient existing education systems, ESD also sought to reframe teaching and learning. Since challenges associated with sustainable development are complex and interconnected, ESD required participatory teaching and learning methods to empower learners to take action (UNESCO, 2014). It was anticipated that these methods would induce learning to ask critical questions, to respond through applied learning, to think systematically, and to envision more positive and sustainable societies.

Although the commitments of ESD seemed promising, Venkataraman (2009) uncovered that sustainable development could not simply be integrated into an overcrowded curriculum; instead, it requires the educational system to be completed transformed. He emphasized that sustainability should not be adapted to fit the education system–rather, the relationship should be the other way around. Additionally, lack of assessment modes in previous environmental education practices have raised high concern (Tilbury et al., 2003). Efforts to bring sustainable development to the classroom by designing curricula with the principles of sustainability in mind have been more encouraging because they engage students through local community challenges and personal content.

At the 2002 World Conference on Sustainable Development, it was determined that more progress was needed in ESD, so the concept of a UN Decade of Education for Sustainable development (UNDESD) was discussed (UNESCO, 2014). In 2005, the DESD was launched and

marked the beginning of 10 years of global commitment towards improving education systems for sustainable development. UNESCO member states agreed to the commitment of including measures to implement the Decade into their educational strategies. To advance the DESD, seven strategies were identified: vision building and advocacy, consultation and ownership, partnership and networks, capacity-building and training, research and innovation, use of information and communication technology (ICT), and monitoring and evaluation.

During the Decade, key learning processes, like collaboration and dialogue, were identified to be critical to the implementation of ESD. Processes that innovate curriculum, involve the 'whole-system,' and provide active and participatory learning were found to reinforce the new framework (Huckle & Wals, 2015). Results from UNESCO's Global Monitoring and Evaluation Questionnaire revealed that participatory and collaborative learning, critical thinking, and problem-based learning were most conducive for ESD. By the end of the DESD, UNESCO stated,

> *It is now possible to see changes in curricular contents that shape knowledge of sustainable development; changes in learning approaches that improve the attainment of knowledge and abilities for sustainability; and outcomes, with respect to student participation and engagement in learning, that are relevant for their future as global citizen* (UNESCO, 2014).

Even with this progress, several challenges still exist (Filho et al., 2015). Firstly, linkages between education and sustainable development are still weak in many countries, leading to barriers in coordination and cooperation. A stronger connection needs to be established to garner the sustained political support needed to drive change. Secondly, Member States have reported that education systems, planning, and policies still lack full implementation of ESD. To drive momentum for system change, it is necessary to better understand how relevance, purpose, and values for sustainability can be embedded into quality education. Finally, limited evaluation tools

have been used to assess ESD learning outcomes, extent of implementation, and quality of programs, leading to lack of evidence for the continued investment in ESD. A review by Pauw et. al (2015) revealed similar challenges as identified by UNESCO and stressed the fact that there is little empirical evidence for the extent of ESD implementation and the effect of ESD on students' attitudes and behaviors towards sustainable development. They found that ESD does induce a consciousness of sustainability among students, however, the extent of the increased consciousness remains undetermined.

The DESD Final Report recognized five priorities that are necessary to continue progressing towards the SDGs. The first priority—advancing policy—focuses on strengthening coherence to ESD frameworks through laws, standards, and directives passed by policy-makers. A second priority surrounds transforming learning and training in both formal and non-formal environments. This means that efforts need to be taken to include ESD-relevant content in all levels of education, as well as in short courses and workplace training (UNESCO, 2014). Capacity-building of educators and trainers is highlighted as the third priority to push the institutionalization of ESD in degree programs, accreditation, and certification standards. The fourth area of priority—empowering and mobilizing youth—explains the importance of using engagement with young people to transform higher education systems. Accelerating sustainable solutions at the local level is recognized as the fifth priority area and focuses on increasing school-community and university-community engagement to improve public awareness and local action for sustainability.

Though many achievements were made during the DESD, it was acknowledged that much work still needs to be done. As identified during the Decade, leadership was one of the greatest success factors that helped to scale up efforts and achievements (Akiyama et al., 2012).

Leadership at the global, regional, national, and local level is critical to create an organizational climate, as well as encourage other individuals to create a more sustainable society by learning, taking risks, and adapting. Even more, individual champions are important in bringing stakeholders together collaboratively and sustaining efforts for change.

Although not entirely successful, ESD and the DESD were key in providing a better understanding of methods to introduce sustainable development, as well as new priorities that may better equip individuals to solve sustainability challenges. First, reviews on ESD revealed that content should be molded to local environmental, economic, and societal conditions to remain relevant and engaging. Assessment modes should also be considered to provide a way to evaluate if targets are being met. The DESD uncovered learning styles that were conducive to introducing sustainability concepts, like problem-based, active, collaborative, and participatory learning. Even more, it deemed leadership as an important area that should be prioritized in the years that followed. Since the content taught through ESD is complex—as made apparent by the plethora of challenges that ESD has faced—presenting leadership skills alongside sustainability content may result in more successful development the individuals who can solve these problems and lead others to do the same. This idea has led into further research into the skills, or competencies, that leaders of sustainable development should possess.

Sustainable Competencies

In an attempt to provide a more explicit framework for developing individuals with a vision for sustainability, many have sought out to determine key competencies for sustainable development. Wiek et al. (2011) conducted a literature-based study to investigate the necessary

competencies that should be reflected in students educated in sustainable development. They reasoned that uncovering these competencies is critical to help establish a commonly shared framework for developing individuals in the academic field, schools, and professions, as well as to provide a reference for evaluation of learning and teaching. The researchers created a framework of linked competencies that, when applied, should enable the student to problem solve and collaborate on sustainability challenges. The framework consisted of five key competencies including the systems-thinking competence, anticipatory competence, normative competence, strategic competence, and interpersonal competence.

Corvers et al. (2016) elaborated on the five competencies, arguing that since sustainable development entails complex, coupled systems, students need the ability to collectively analyze complex systems across the society, economy, and environment; so, it was determined that the systems-thinking competence was crucial. Sustainable development also requires long-term envisioning and anticipation of consequences, so the anticipatory competence was deemed necessary for equipping students with the ability to craft "pictures" of the future and evaluate these visions based on future-oriented knowledge. To enable students with the ability to assess the sustainability (or unsustainability) of systems and subsequently create visions for these systems, the normative competence was important. The concept of sustainable development also requires "linking knowledge to action," so the strategic competence was determined to be vital in providing the ability to design and implement solutions toward sustainability. Addressing sustainability challenges necessitates collaboration with stakeholders and a variety of other disciplines, lending importance to the interpersonal (or collaboration) competence. The interpersonal competence is highly linked to all other competencies and can provide the ability to facilitate collaborative research and problem solving for sustainability. When developing these

competencies, it is advised that students find a balance between specialization and generalization; that is, acquire expertise in one to two competencies two and a solid foundation in the others, rather than attempting mastery in all five competencies (Wiek et al., 2011).

Rieckmann (2012) also sought to determine key competencies that are necessary for understanding and navigating challenges faced by society for a more sustainable future since there is little global agreement on the most important competencies. This study built upon an earlier understanding of competencies, outlined by de Haan (2010), believed to enable reflective, active, and co-operative participation towards sustainable development in Germany. The findings, known as "Gestaltungskompetenz" (capacity to act and problem-solve), outline twelve sub-competencies necessary to shape the economic, ecological, and social behaviors to promote a sustainable future. The sub-competencies of Gestaltungkompetenz consist of the ability to gather knowledge in a spirit of openness to the world, integrating new perspectives; think and act in a forward-looking manner; acquire knowledge and acting in an interdisciplinary manner; deal with incomplete and overly complex information; co-operate in decision-making processes; cope with individual dilemmatic situation of decision-making; participate in collective decision-making processes; motivate oneself as well as others to become active; reflect upon one's own principles and those of others; refer to the idea of equity in decision-making and planning actions; plan and act autonomously; and show empathy for and solidarity with the disadvantaged (de Haan, 2010).

The study performed by Rieckmann (2012) revealed that (1) awareness and ability to develop key sustainable competencies relies on higher education with sustainability-related curriculum and (2) key competencies have different relevance and meaning in different contexts.

It was found that a system thinking competence, anticipatory thinking competence, and critical thinking competence are the three most important competencies for sustainable development. Interestingly, data indicated that Latin-American experts found competencies for cooperation in groups and participation to be more relevant, while European experts indicated that competency for empathy and change of perspective are more important. This means that when developing higher education, universities and educators should consider that certain competencies may be more relevant depending on the context. Similarly, Barth et. al (2007) found that competence development can be enhanced when a variety of conexts are given. Still, it was reasoned that further research was necessary on the interdependencies of the competencies in order to better assess the key competencies for sustainability.

These findings, as well as UNESCO's 2017 framework for ESD, consolidate the most important competencies necessary to advance sustainable development. It is believed that these competencies can empower individuals to act creatively and take self-organized action for complex problem solving (Rieckmann, M. Mindt, L. and Gardiner, 2017). Further, UNESCO states that they are not independent; rather, the competencies are transversal, multifunctional, and context independent. The competencies include systems-thinking, anticipatory, normative, strategic, integrated problem solving, self-awareness, critical-thinking, and interpersonal competencies. From here, the eight competencies stated previously will be referred to as the "sustainable competencies."

While it is important to uncover the competencies necessary to evaluate learning in ESD, it is even more critical to determine the methods to cultivate these competencies in students. A literature review reveals a disparity in understanding the best ways to empower students to

develop the sustainable competencies. Imara and Altinay (2021) reviewed the incorporation of sustainable development competencies into education during the last decade and uncovered the lack of a unified framework for integration. They explained that in order to empower educators and their students to nurture sustainable competencies in themselves, it is indispensable to explore how to integrate these competencies into education.

In a similar study, Cebrián and Junyent (2015) determined that there needs to be further exploration into how context influences students' perceptions and responses. They also found a disconnection between frameworks related to ESD competencies and the actual awareness and views of students in ESD. These findings indicate that to better understand how to introduce sustainable competencies into education, it is required to examine students' perceptions, knowledge, and interest of sustainable development.

Generally, it seems that a consistent finding is the suitability of the eight sustainable competencies. Building upon lessons learned in ESD and the Decade, those interested in solving sustainability challenges should show aptitude in systems-thinking, anticipatory, normative, strategic, integrated problem solving, self-awareness, critical-thinking, and interpersonal competencies. However, there is little understanding on methods to cultivate these competencies in students. It is suggested that further research into perceptions and interest in sustainable development is critical into understanding how to empower individuals to develop these competencies. Since leadership education has shown promising results in developing similar skills, one idea is to investigate how leadership may be leveraged to develop the sustainable competencies.

Leadership

Leadership on its own is commonly defined by leadership theorists as a force of influence resulting in change or outcome and uniting followers around a common goal (Sanders & Davey, 2011; Gemmill & Oakley, 1992). Daft (2014) defined leadership as "an influence relationship among leaders and followers who intend real changes and outcomes that reflect their shared purpose," emphasizing influence, shared purpose, and change as common elements of leadership. There are many definitions and theories of leadership that have evolved into a "jungle" of leadership literature which Sanders & Davey (2011) sought to deconstruct in their meta-model of strategic leadership containing three main elements: a task component, a development component, and an interpersonal or communication component. According to Hollander (1992), the task component focusing on meeting goals and understanding the progress towards meeting them is the most important element of leadership. The development component deals with the leader's ability to adapt to different scenarios and challenges. Finally, the interpersonal component measures communication skills between the leader and followers.

Since effective leadership is critical to reaching a common goal, another studied route to introduce the skills needed for sustainable development is through leadership training. Dugassa (2021) argued that fostering sustainable development requires advancement of leadership. By exploring the relationships between public health problems and climate change within the Horn of Africa, he revealed that leadership is needed to address problems at the "upstream" level. He observed a complex, intertwined set of problems like inequitable and unsustainable policies, lack of adoption of new knowledge, and rapid urbanization without proper environmental regulations and social programs. Because these problems are ubiquitous and complex, leaders are needed to

act at the "upstream" level. Upstream interventions, or finding the root of the problem, are more successful than downstream interventions, or trying to fix the problem once it has already happened, because upstream interventions ultimately require less work and time. He explains that it is critical to "shift our paradigm of thinking" to create new tools for sustainable development, including improving leadership and institutions to produce individuals that have a vision for social and environmental justice. Other organizations agree with Dugassa's argument. UNESCO's DESD Final Report cites capacity-building for leaders as a critical need, stating that leadership is essential for advancing policy and ensuring objectives are moved into action (UNESCO, 2014).

Many have even found that introducing sustainable development in tandem with leadership training has been effective in developing individuals who have skills to address sustainable development, as well as abilities to encourage others to follow. In 2004, the Blekinge Institute of Technology (BTH) launched the Strategic Leadership towards Sustainability master's program (MSLS) in Sweden. This program aimed to develop skills and competencies for sustainable development in participants by pairing personal and organizational leadership skills with a scientific framework surrounding strategic decision making toward sustainability. In a review of the MSLS, Missimer & Connell (2012) sought to understand how pedagogical approaches were incorporated into the program's design, what sustainability leadership skills were developed in alumni, and which of the design elements caused the successful development of these skills. The researchers found that the pairing of the themes—Framework for Strategic Sustainable Development and the Organizational Learning and Leadership—was key to encourage participants to collaborate and create meaningful solutions. Components of problem-based learning, active learning, and transformative learning were all helpful in evolving

important skills in participants. The results of the review demonstrate that the program was successful in equipping graduates with the expertise needed to approach sustainability challenges (Missimer & Connell, 2012).

Even with evidence to suggest that leadership may be the missing component of a successful method to introduce sustainable development and the sustainable competencies, few have investigated their direct connection. Slimane (2012) clarified the role of leadership in sustainable development by finding a connection between sustainability progress and successful leadership. She concluded that influencing human behavior, carrying out of objectives, and driving energies towards a main goal are all characteristics of effective leadership that are vital to progress in sustainable development. Similarly, Dartey-Baah (2014) found a link between leadership and attainment of sustainable development, suggesting that leaders are necessary to galvanize creativity, participation, and vision.

Since many of the skills foundational to leadership are also critical for progress in sustainable development—like creativity, problem-solving, and collaboration—it makes sense that developing individuals with a vision for sustainability should have a strong foundation of leadership. Leadership for Sustainable Development focuses on, first, providing an understanding of leadership so that an individual can develop their own leadership identity. Then, sustainability topics can be introduced so that the leader can develop specific competencies while engaging in problem-solving or collaboration. The goal of Leadership for Sustainable Development is to provide a more direct pathway for leaders to develop competencies that are critical for sustainable development.

Taken together, this research suggests that progress towards global sustainability relies on effective leaders, otherwise known as Leadership for Sustainable Development. Though a newly discovered field with ambiguous implications, leadership for sustainable development is based on several well-researched fields. As discussed, there already exists a clearly outlined set of goals and skills that should be attained—the 17 SDGs and 8 sustainable competencies. The disconnection lies in how to cultivate these competencies in individuals so that they have a vision for sustainability. Since leadership studies have demonstrated that leadership approaches can lead to the development of certain competencies, and that effective leaders can use those skills to solve challenges, leadership may be useful in developing the sustainable competencies. Thus, to better equip individuals with the ability to reach sustainability goals, it seems critical to investigate how competencies develop while leveraging leadership education.

Methods

The overall research design is a mixed methods explanatory design (Plano Clark & Ivankova, 2015) in which an initial quantitative study will be used to provide guidelines to identify key relationships among participants' leadership identity and sustainable development competency factors, a second phase will consist of a qualitative study of the underlying mechanisms contributing to participants' interest and motivation to address sustainability issues, and a final phase that will integrate results from the quantitative and qualitative phases. Specifically, quantitative data will be analyzed to identify specific factors that influence participants' interest in sustainability issues and career development in sustainability, investigating participants' demographic, prior education, and work experiences that most strongly connect to their career advancement according to career development theory. These individual characteristics will be used to conceptualize and guide questions for semi-structured interviews to investigate perceptions of the sustainable development competencies.

Participants

Participants were enrolled in online leadership development for sustainable development training. This training is designed to introduce participants to learn sustainability-related topics such as sustainable wellbeing and sustaining motivation, leading a project team, and attempting to contribute to society and lead sustainable change. It also introduced the sustainable competencies and the importance of leaders to develop these competencies.

To obtain a deeper understanding of the perspectives on sustainable development and how that may intersect with one's leadership identity, 16 participants were chosen for further qualitative research. The participants, each given a pseudonym, were selected considering their gender and cultural background to obtain a diverse set of responses.

Table 1. Study Participants

Participant	**Gender**	**Country**	**Continent**	**Education/Career**
Anthony	Male	United States	North America	Mechanical Engineering
Belle	Female	United States	North America	Engineering Leadership and Innovation Management
Caron	Male	United States	North America	Industrial Organizational Psychology
Diana	Female	United States	North America	Mechanical Engineering
Ella	Female	United States	North America	Industrial Engineering
Fai	Male	Uganda	Africa	PhD in Diplomacy and Affairs
Gabriella	Female	Cameroon	Africa	International Development Expert
Halima	Female	Kenya	Africa	Journalist, Founder of nonprofit organization
Ike	Male	Ghana	Africa	Agricultural Leadership Education and Communication
Jan	Male	Kenya	Africa	Community Development worker
Kwan	Female	South Korea	Asia	Business Administration

Lida	Female	Japan	Asia	PhD in Network Science, Computational Social Science
Myung	Male	South Korea	Asia	International Studies
Norma	Female	Saudi Arabia	Asia	Professor, Human Resource Development
Olivia	Female	South Korea	Asia	Global Citizenship Education
Prescilla	Female	South Korea	Asia	English Language and Literature

Qualitative Data Collection

Interviews were conducted over Zoom and consisted of questions surrounding interest and knowledge of sustainable development, interest and knowledge of leadership, and perception of the sustainable competencies.

Table 2. Sample Interview Questions

Where are you currently working? What do you do?
Which of the SDGs are you interested in? Why?
Do you have any personal experience that has caused you to be interested in a sustainability issue?
What do you believe is the most urgent sustainability issue in your community?
How do you think leaders/community members can mitigate these issues?
What leadership skills would you still like to improve?
Which UN competencies do you think are most important when addressing sustainable development challenges?
As a leader, which UN competencies do you think you have? Which do you think you still need to develop?

Quantitative Data Collection

After the interview was concluded, all participants were sent a follow-up survey via Qualtrics. The participants reported on statements like “Your knowledge of sustainable development and the 17 SDGs” and “Your interest in development and the 17 SDGs” on a 10-point Likert scale (No knowledge/interest = 1, The most knowledge/interest = 10). The participants also responded to the question “How closely do you identify with being a leader?” by ranking their answer on a 10-point Likert scale (Weakly = 1, Strongly = 10). Finally, participants were asked to rank the eight sustainable competencies in order of importance for leaders who want to overcome the challenges associated with sustainable development (Most important = 1, Least important = 8). A document with the sustainable competencies and their meaning was provided to ensure all participants had the same understanding of each competency.

The results were grouped by participant location, with five participants coming from North America, five participants coming from Africa, and six participants coming from Asia. The average ranking of participant knowledge and interest of sustainable development and the 17 SDGs, as well as their indicated leadership identity, was determined.

Results

Qualitative Findings

The primary aim of this study was to investigate interest in sustainable development and uncover perceptions associated with the sustainable competencies. Three themes emerged from data analysis. The first referred to participants' interest in sustainable development and included stories associated with the participant's childhood, background, or career. Another theme surrounded the competencies that participants believed were most important and confirmed the interconnectedness of the competencies needed for sustainable development. The final theme was associated the competencies that each participant believed they possessed and was related to the leadership attributes they demonstrated, such as problem-solving, critical thinking, and interpersonal skills.

Theme 1: The SDG(s) that participants were most interested in were strongly connected to their personal experiences.

The first theme is a connection between a participant's interest in certain SDGs and their personal experiences in sustainable challenges. After describing the SDGs that they were most interested in and the personal experiences with sustainable development challenges that they encountered in their local communities, it was apparent that the participants found the most interest in the goals that addressed these challenges. With the participants coming from different backgrounds and cultures, specific interest in the 17 SDGs varied widely.

Anthony stated that he was most interested in goals surrounding global health and energy. Before discussion on this topic, the participant had shared that he had some background in

Medical Devices and the healthcare industry as a result of having both parents working in healthcare. He recalled interacting with individuals who could not afford the best quality of medical care. When discussing some of his personal experiences with sustainable development, Anthony stated,

> *One of the things about the Midwest is that it's a slower area of the country to get all the new developments. Most people there can't afford whatever the new innovation is… it's interesting because on the whole, each Missourian is a more sustainable citizen of the US. But that's not because they want to be that way, it's because they're forced to not accept the newer innovations…It makes it personal because… one part of the country has the wealth to use up something before the rest of the country gets it.*

Belle remarked that she was most interested in goals addressing women empowerment and poverty. She shared some of her personal experiences growing up in India and said,

> *In my personal experience, I have seen women who have been educated…still they are not working because their family doesn't allow them to work or…the woman should not work if they get married…but I would like to see women get empowered and feel like they are the part of the society…They are a resource, and they should get what they need to grow our country in any way whatever skills they have…I feel like it should be more sustainable for women that they take part in things that are a huge responsibility for the country as well, not just the home that they are married into.*

> *So apart from this, in my experiences there have been hunger issues that I have seen but there is no proper treatment. There are people who try to make food available for the poor people during winters or but the thing is, I see it's very much unorganized and it's like the people have to roam around here and there on the road.*

Ike was most interested in the goals surrounding zero hunger and good health and well-being. As a teacher, he had extensive experience with children who did not have access to the nutrition needed for cognitive and physical development. Ike shared,

> *This is a very good program [Ghana School Feeding Program], helping to also help solve malnutrition in children, but as a head teacher with eight years experience, I have realized most of the caterers use cheap and unhygienic food…to cook for the students which defeats the main aim of the program.*

Fai shared his interests in multiple goals, including Zero Hunger, No Poverty, and Climate Action. He explained the interconnection of poverty and hunger and described its prevalence in his country. Even more, according to the UN, goals associated with Zero Hunger and No Poverty are not expected to be achieved by 2030. When describing his personal experiences with sustainable development, Fai stated,

> *In an African context, where I come from, the issue of poverty is commonplace as manifested in sustained wars, hunger, high illiteracy levels, and significant socio-political and economic exclusions….With the trilemma of coronavirus, climate change, and now the Russia-Ukraine War, developing regions such as Africa are likely to have sustained poverty problems.*

Similarly, Halima also placed high importance on Goal 1: No Poverty. She shared her experience with poverty that catalyzed her passion for working towards this goal,

> *As a kid, I didn't know I was poor. I didn't realize until I was an adult because I was so happy and fulfilled. But, I have no memory of going to school without shoes…and having to walk for long distances in the rain….No child deserves to live in poverty because they do not choose where they are born.*

Prescilla found the most interest in Goal 4: Quality Education. She explained that this goal aligned closely to her field of study–literacy and education–and was the main reason she chose to pursue her degree. When recalling her educational experience at a young age, she felt disappointed and lost. She stated,

> *To be frank, I think I'm a victim of Korean education. It's just never sustainable and it doesn't really promote any potential from the students…I think that that's the reason why I… felt lost… But that's the reason why I need to look for an alternative for Korean education. I kind of concluded that education shouldn't be the field of giving knowledge, but raising people to live fully as a human, not like a machine. That's why I'm really eager to change the education in Korea.*

Unlike other participants, Kwan had no experience with the SDGs. Upon first introduction of the Goals, she found the most interest in Goal 4: Quality Education.

> *I think I grew up with a decent education…Because of that, I think I was able to get into University and study better…I know that with better education can look better and lead to better living standards.*

Interestingly, the SDGs that participants were most interested in were not necessarily the ones that they considered to be of highest urgency in their community. In fact, the sustainable challenges that the participants were most interested in differed greatly from the challenges that they considered the most urgent in their local communities. Although personally interested in different SDGs, the participants were able to assess and identify the challenges that their community faced. Anthony stated,

> *The issue of education and healthcare are higher priorities for that community [Missouri]… Even though I'm more personally interested in energy, I wouldn't say that it's their top priority because we still have people who don't have access to good work… So, there is work there, it's just in the cities it's next to the universities. It's for the people who have an education. Anyone who's out in the countryside doesn't have access to those things.*

After discussing her interest in goals surrounding Women Empowerment and Poverty, Belle outlined different challenges that she believed were most urgent in her community. The most prominent challenge surrounded Justice and Strong Institutions, as she shared stories of injustice and lack of trust in elected members of government. Belle stated,

> *They [elected members of government] should be very much responsible for their actions, which they are not as of now, and they are not accountable for it...There must be more transparency of the things that they are implementing on a local level…The people of that society can't see where their tax money is going…The tax they are paying is for their society, not for the pocket money of the local leaders.*

Fai shared that Climate Action is the most urgent goal in his community. He explained that Africa is most susceptible to the effects of climate change, despite contributing the lowest emissions. He shared,

> *Like any other country, Uganda is experiencing the drastic effects of climate change, as greenhouse gas emissions are increasing to an alarming degree. Global warming is causing long-lasting changes to our climate system…It is clear that unless something is done to bolster efforts to fight climate change in Uganda and Africa in general, those as mentioned…will aggravate development problems on the continent.*

When discussing the goals they were interested, as opposed to the goals they believed were most urgent in their community, the participants spoke at greater length and shared more emotional, intimate details. These results indicate that a participant's personal experience with sustainable development challenges play a significant role in the SDGs they are interested in, sometimes regardless of the importance of that goal in their current community.

Theme 2: The participants recognized the wide-range and interconnected leadership competencies needed for sustainable development.

Another theme surrounded participants' perspectives on the leadership competencies needed for sustainable development. It was found that participants believed all competencies offered an aspect of importance for sustainable development. They used words such as 'linked' and 'interconnected' to describe why all eight competencies were critical for leaders to employ. Anthony stated,

> *I think that many of these competencies are linked…If I could ask for a leader in sustainable development to have all of these competencies, I would.*

Similarly, Fai, Halima, and Jan explained,

> *They are all important, especially at a time when we have complex, multifaceted, and multi-layered problems. Moreover, they are closely connected in many ways.*

> *I think all of them because they're working together. I don't see any that is independent of the other, so I think all of them are very important in addressing sustainability. They have different values which I cannot remove from them.*

> *I think all of them are pretty important, and a leader should have as many of these competencies as possible because I think they are all required.*

These findings suggest that the participants quickly recognized that a wide-range of skills are necessary to reach sustainable development goals. It shows that the participants acknowledge that leaders must have a diverse set of skills to make an impact.

Some participants seemed able to pick out a competency that they believed was most important. However, as they continued to investigate the list of competencies, they changed their answer multiple times. Olivia and Norma said,

> *The collaboration competence seems most important…Actually, the interpersonal and critical thinking competencies seem important, too.*

> *At first, critical thinking is what I thought would be most important for sustainable development, but now it seems like collaboration and self-awareness may be just as important.*

Other participants followed this same pattern, almost acting unsure of their final answer if they provided just one competency. Interestingly, out of all the questions in the interview, this question took the longest for participants to answer and produced the most doubt. Some participants asked me to restate the question, and some seemed to believe I was asking the question as a "trick." These patterns made it apparent that the participants found importance in multiple, if not all, of the competencies. They recognized the importance of having various competencies, without one that is more important than others. This theme did not show any trend based on participant gender, location, education, or career.

Theme 3: Participants' leadership competencies were demonstrated in their thought process and ideas to reach SDGs.

Participants shared the leadership competencies that they believed they possessed. Later, the participants specifically addressed how they believed a leader should mitigate challenges with sustainability. From these findings, a connection between personal competencies and the thought process to reach SDGs was established. For example, Anthony stated that he possessed a strong collaboration competency. Leaders with strong collaborative skills harness the ability to understand other perspectives and handle conflict. Interestingly, his thought process for reaching SDGs reflected his collaborative competency. He stressed the importance for leaders to understand public perception in order to get the community invested. He shared,

> *When people hear sustainability, what they hear is the rich people have a pet project. 'They want to make the world a better place. One hundred years from now, that does nothing for me. Personally, I'm not interested.' … So they don't ever get to see the personal, moral, ethical or technical responsibility, whatever it may be, it doesn't get transferred to the person. So I think if a leader was going to tackle this, one of the things that they should do is get the public invested.*

Similarly, Halima believed that she harbored abilities of the collaboration competency. Like Anthony, she felt she had skills in motivating communities to work towards sustainable development goals. Interestingly, she explained a similar approach to Anthony, and highlighted the need to get the public invested.

> *I think awareness is something that's really lacking….When you go and tell someone to take action on climate change, they don't understand…because the effects are not shown immediately. But in leadership, I think these are things we need to take them through gradually…It's about starting to integrate yourself slowly into the community by starting to attend the community gatherings and getting a platform to talk about it.*

Belle reflected that she possessed the strategic competency which relates to the ability to ideate actions at both the local level and further afield. This competency strongly relates to

design of system interventions and strategies that help with the transition to a more sustainable society. When ideating on actions that leaders could take, the participant had clear ideas and provided a specific example relating to the urgent challenge surrounding injustice in local governments. She explained,

> *On a local level it's really important to implement such a plan where the people who are like responsible for such local tasks…are accountable for it. There should be some database where they will be putting in their efforts like…money they have got from the government and where all it has been channelized.*

Jan stated that he had both the critical thinking and systems thinking competencies. He explained that he felt his critical thinking competency allowed him to recognize problems and his systems thinking competency allowed him to create solutions. Since a common problem in his community is finding a stable job, he explained his ideas to improve professional development in his community, saying,

> *I think a lot of people don't recognize it is a problem* [inability to find a job]*…They think it is the usual and completely out of their capacity to control. But I always think to myself, 'this is something we can change!'. We need to look into the bigger picture and find connections in our community. We have members who have stable, good paying jobs…We need to recruit them into our schools to provide professional advice to others. They are our connection to the jobs.*

Prescilla explained that she had qualities of the self-awareness competency. Throughout describing her approach to mitigate sustainable development challenges, she vocalized how she wanted to be 'aware' and 'cautious' of the leader she is being. She also felt she had strengths in the collaborative competency and invoked this as she explained her vision for improving Korean education.

> *Even though I have a vision, I can not just realize it alone…I need to look for some younger generation who will agree to my intention and my motivation….That's why I'm interested in education for middle and high school students, because…college level students, they're already chosen the* path *and set in their ways.*

Naturally, the participants also seemed to convey these competencies throughout the interviews, whether that be through body language or in other discussion topics. In fact, it stood out that Anthony and Halima—both who believed that they harnessed the collaboration competency—displayed collaborative action and demeanor. For example, out of the entire study group, only Anthony and Halima asked me questions during the interview, seeming curious to probe my thoughts on sustainable development. Halima asked for my personal email, explaining her interest in future collaboration.

Although most participants were able to recognize one or more competencies in themselves, a few were unable to provide an answer. Caron, Kwan, and Norma stated that they were unsure if they had fully developed any of the competencies. When asked to discuss her thought process in addressing a sustainability challenge, Norma said,

> *There are a lot of challenges in my community, I do not know if I could come up with a solution right now. Actually, I am not sure if there even is a solution to the problems.*

It was very surprising to hear that participants were unable to identify any competencies that they possessed. At the same time, it was also interesting to see that they understood themselves enough to recognize that they did not possess a competency, or at least that it appeared that way. Overall, the qualitative findings provided a breadth of insights into participants' perceptions and interest in sustainable development. It also provided important linkages between their problem-solving skills and the sustainable competencies.

Quantitative Findings

The intention of this study was to collect distinct, quantitative data linked to each interviewee. It enabled a deeper understanding of their answers, and it helped to shed light on possible patterns behind their reasoning. The rankings on knowledge and interest of sustainable development and the 17 SDGs, as well as indicated leadership identity, from participants in North America, Africa, and Asia can be seen in Tables 3, 4, and 5, respectively.

Table 3. Knowledge and Interest in Sustainable Development and the 17 SDGs: North America

Participant	Knowledge Level	Interest Level	Leadership Identity
Anthony	7	8	10
Belle	8	9	9
Caron	5	7	4
Diana	6	7	7
Ella	7	7	5
Average	6.60	7.60	7.00

Table 4. Knowledge and Interest in Sustainable Development and the 17 SDGs: Africa

Participant	Knowledge Level	Interest Level	Leadership Identity
Fai	9	10	9
Gabriella	10	9	8
Halima	9	10	10
Ike	9	10	8
Jan	8	10	10
Average	9.00	9.80	9.00

Table 5. Knowledge and Interest in Sustainable Development and the 17 SDGs: Asia

Participant	Knowledge Level	Interest Level	Leadership Identity
Kwan	4	7	3
Lida	5	6	6
Myung	7	9	8
Norma	3	2	5
Olivia	5	9	9
Prescilla	7	8	8
Average	5.17	6.83	6.50

Upon comparison of the quantitative and qualitative data, three relationships emerged. First, average interest and knowledge in sustainable development and the 17 SDGs varied depending on the continent that the participant was from. Only four participants ranked their interest as a 10—all of which were from Africa. Following a similar pattern, the average interest level of participants from Africa was 9.80, whereas average interest level from participants in North America and Asia was 7.60 and 6.83, respectively.

Although average interest and knowledge varied between continents, the developed sustainable competencies were relatively consistent, independent of the participant's continent. All four African participants who ranked their interest as a 10 believed that they harnessed similar competencies. Fai and Halima both shared that they had strong collaboration competencies, while Ike discussed he had both the systems thinking and collaboration competencies. Jan touched on both his collaboration and systems thinking competencies, but said he also harnessed the critical-thinking competency. The common competencies between the four participants—collaboration and systems thinking—were also discussed by other participants with high interest and knowledge of sustainable development.

This finding was consistent with the participants in Asia who had the highest interest and knowledge rankings, Olivia and Myung. Both avidly shared that they harnessed the collaboration competency. In North America, Belle and Anthony ranked highest in knowledge and interest, but only Anthony suggested that he had the collaboration competency. Still, it was notable to find that almost all of the participants that were most invested in sustainable development believed that they possessed the collaboration competency.

A second relationship was found between the knowledge and interest rankings on sustainable development and the 17 SDGs. The levels of knowledge and interest seemed to directly impact each other; in other words, if a participant indicated a high level of interest, they were also likely to indicate a high level of knowledge, and vice versa. Remarkably, the majority of participants ranked their knowledge level and interest level within one ranking unit of the other, with only two participants indicating more than 2 ranking units of difference between their knowledge and interest levels. This pattern was noticeable across all participants, regardless of the continent that they reside.

Lastly, by comparing participants' leadership identities with their qualitative responses, a third relationship was identified. Participants who indicated a high level of leadership identity were more likely to recognize the sustainable competencies that they possessed, as opposed to participants who indicated a low level of leadership identity. In fact, Caron, Kwan, and Norma indicated the lowest level of leadership identity among all participants (4, 3, and 5, respectively), and they were also the only participants unable to identify a sustainable competency that they possessed. In comparison, participants that were able to effortlessly identify and elaborate on a sustainable competency that they possessed—like participants Anthony, Fatima, and Halima—indicated a high level of leadership identity (10, 10, and 10, respectively).

Discussion

The findings presented above demonstrate linkages with existing literature, as well as build upon existing knowledge in the field of leadership for sustainable development. They also present ideas that may help to close the gap in understanding how to introduce sustainable competencies into leadership education and the methodologies behind how the competencies develop in certain individuals. First, I will discuss how the findings advance existing ideas on integrating the sustainable competencies into leadership education. Then, I will share how the results further our understanding of how the competencies develop in leaders, as well as methods that may help to ensure successful competency development.

Introduction of Sustainable Competencies in Leadership Education

Sustainable development is complex, multilayered challenge that requires a paradigm shift of thinking—something that leadership education may be able to support. As explained by Dugassa (2021), the focus must be placed on developing leadership and institutions that are prepared to foster a culture of sustainable development. One idea outlined by Dugassa was the idea that spirituality and the interconnection between the social and natural world are critical layers of sustainable leadership. He shares, “we do what we already have in our minds,” and explains that policy direction is often set by how an individual already views their community. Building on his idea, this study demonstrated that participants were most interested in sustainable development when it related to their personal experiences or background. By leveraging an individual’s experiences when introducing sustainability topics, it may be possible to create a

sense of belonging and tap into the critical layer of spirituality in Dugassa's idea of sustainable leadership.

A similar idea was also found by Pauw et al. (2015), who described the approaches of *holism* and *pluralism* in ESD. While *holism* places greater focus on using the interconnection of environmental, social, and economic to educate on sustainable development, *pluralism* emphasizes the process of teaching and developing the sustainable competencies. Although both are important in the introduction of sustainable development, in order to achieve behavioral change, it was found that a pluralistic approach may be more desirable. Still, the authors recommended further study into the methods that may improve pluralism and tap into an individual's sustainability consciousness. The findings presented in this study suggest that tailoring sustainability content towards an individual's personal experiences may improve learning and behavior change. It also supports that there is no "one size fits all" solution to introducing sustainable development (Pauw et al., 2015). Participant location, background, and personal experiences should all be considered when introducing sustainability topics and competencies.

This idea is further supported by Horlings & Padt (2013) conclusion that leaders' agendas went beyond individual and business goals; they were also deeply rooted in feelings and awareness of sustainability challenges. The authors reasoned that there is a factor—deemed the 'X-factor'—that was the main source of motivation for leaders of change that kept them enthusiastic and able to mobilize the people around them. Though still a new area of research, they postulated that the 'X-factor' was a more personal matter, embedded in personal motivations, that was the basis for progress in sustainable development. The current study may

provide further insights into the ‘X-factor’ since the results suggest that interest in sustainable development is highly dependent on personal experiences and background.

In a different study conducted by Pauw & Petegem (2013), the authors surveyed environmental education programs and found that the programs increased knowledge on sustainability but did not necessarily impact attitudes and behaviors. Conversely, this study found that individuals with high levels of knowledge tended to find more interest in taking action towards sustainability. This distinction may have resulted from the participants used in the study, as the researchers surveyed grade-school students while this study utilized undergraduate and graduate-level students. Additionally, they argued that the missing link between knowledge and attitudes may be the result of ineffective education practices, referring back to the need to better understand holism and pluralism in ESD.

Nevertheless, it seems a consistent finding is the importance of tailoring sustainability topics to fit the audience in leadership education. Since the introduction of these topics can be complex and overwhelming, leveraging an individual’s personal experience and background may be the key to successfully introducing leadership for sustainable development. As supported by Dugassa (2021) and Pauw et al. (2015), including individuals in decision-making processes and challenges associated with a sustainability topic that they have personal experience in, rather than encouraging learning in all areas of sustainable development, may be most effective in leadership education.

Development of Competencies

Once the sustainable competencies are integrated into leadership education, the focus then transitions to how the competencies develop in leaders, as well as any indications of successful competency development. As explained by Wiek et al. (2011), a significant challenge is not only mastery of the individual competencies, but the ability to actually *use* the competencies in a meaningful way to solve sustainability challenges. They argue the need for further research on learning evaluations to measure the level of competency development and performance.

Though the current study was not intended to formally evaluate development of the sustainable competencies, the qualitative interviews provided an unforeseen understanding of how one may assess a leader's competencies. As demonstrated in Theme 3, participants revealed their sustainable competencies through their thought process and ideas to reach the SDGs. For example, participants that believed they harbored the collaboration competency expressed ideas revolving around community engagement and public investment, whereas participants who recognized they possessed the strategic competency described step-by-step plans and implementation stages at each level. In other words, the acquired competency was evident in the participant's problem-solving abilities. This suggests that observing a leader's approach to a challenge or their problem-solving skills may be a suitable method to determine if a competency has been developed.

These findings support insights gathered by Redman et. al (2021), who reviewed assessment tools for sustainable competency development. The authors grouped the tools into three clusters, with one of the clusters being observation-based assessment procedures. They

found that when students were assessed on a task that provided the opportunity to demonstrate a specific competency, evaluators were able to observe if a competency was present in the student. However, it was cautioned that observation assessments could be subjective, especially if there is not a clear rubric for what should be observed. Using the results from this study, a possible rubric could take on the form of key words or themes associated with each competency. For example, in an assessment of the collaboration competency, an evaluator may look for words and phrases like *communicate, other perspectives,* and c*ommunity*; or they may search for themes in the participant's ideas, like understanding others' needs or getting the community involved.

Another important finding in this study was the connection between a participant's leadership identity and their ability to recognize the personal development of sustainable competencies. Participants that indicated a high leadership identity were more likely to be able to recognize the sustainable competency that they possessed, in comparison to those who indicated a low leadership identity. Though this idea has not been explicitly stated in current literature, Horlings & Padt (2013) shared that high performing leaders in sustainable development were able to identify their own capabilities. The leaders were highly aware of their capabilities and were able to recognize strengths and weaknesses in their leadership styles, all of which aided in their performance to overcome sustainability challenges. Similarly, as echoed by Missmer & Connell (2012), including a both a leadership and sustainable development component helps learners to build and understand the skills necessary for challenges in the field.

This idea further emphasizes the importance of leadership when introducing and developing the sustainable competencies. Taken by themself, these competencies may seem complex and interconnected, but with a strong sense of leadership identity, individuals may find

more success in competency development. Without an established leadership identity, individuals risk the inability to understand how the competency fits into their skillset, as well as how to use it to solve sustainability-related challenges.

Implications and Future Study

While existing research has focused on establishing a set of competencies essential for a vision of sustainability, the present research has provided a deeper understanding of the factors that contribute to the development of these competencies. The results build on existing evidence that leadership may be a key component to introduce sustainability topics and competencies. By using components of leadership education, my findings provide several implications that may be important to those involved in developing leaders with a vision of sustainability.

My results show that it is important to consider an individual's motivation and personal experience with sustainable development to successfully introduce sustainability competencies and topics. Personal background and involvement with sustainability challenges contributed to higher interest in one or more of the 17 SDGs. This suggests that personal experience should be leveraged when introducing sustainable competencies to strengthen interest and understanding. Thus, to effectively introduce competencies, educators and those involved in developing leaders should consider tailoring content so that it relates to their learners.

Another result indicates that development of sustainable competencies can be evident in an individual's problem-solving skills. These findings suggest that competency development can be assessed by observation or through discussion of sustainability challenges. Those involved with developing leaders could use this result to evaluate if someone possesses a specific competency. Similarly, the present research shows that individuals with a strong leadership identity can personally recognize development of sustainable competencies. This builds on the existing understanding that leadership is a key aspect of sustainable development. For successful competency development, educators and leadership coaches should first focus on establishing a

foundation of leadership in their learners. This will enable a strong leadership identity to which the sustainable competencies can build from.

Although this study provides a deeper understanding of how one can better introduce the sustainable competencies and foster their development in leaders, a few questions remain. First, it is still unknown if there is a 'degree' of competency development; that is, if the level of development of a competency impacts the individual's ability to use it. Can someone still in the process of developing a competency effectively solve sustainability challenges, or is there a level of expertise that one must reach first? Secondly, this research focuses on competency development in those with some experience in leadership. Therefore, it is not well understood if someone with little to no experience in leadership will benefit from the results of this study. Further research should be conducted to investigate if similar results are obtained with participants who have no leadership experience. Additionally, this field could benefit from other studies that examine leaders with different levels of expertise in the same competency. It would be valuable to understand their abilities to solve sustainability challenges at different stages of competency development.

Conclusion

As global concern on the progress of sustainable development continues to grow, it is now—more than ever—critical to advance the leaders who will aid in the world's development towards sustainability. Although the competencies believed to be needed by these leaders is well-defined, the factors that impact competency development is still unclear. This paper has attempted to provide a deeper understanding into how the competencies could be introduced into leadership education and how different factors could foster successful competency development.

The study provides evidence that an individual's personal experiences and background plays a strong role in interest in sustainable development. Since leaders of change are greatly impacted by their personal motivations and awareness—not just individual and business goals—someone's experiences, background, or location should all be considered when introducing sustainability topics and competencies. It is believed that tailoring content towards an individual's experience when introducing the sustainable competencies may improve learning and behavior change.

In terms of assessing if a competency has been developed, this study suggests that observing a leader's approach to a challenge or their problem-solving skills may be a suitable method for evaluation. It was noticeable that the possessed competencies were evident in the participant's approach to sustainability-related challenges. Therefore, looking for words, phrases, and other themes in a problem-solving scenario may provide an understanding on if a specific competency has been developed.

Finally, the study highlights the interrelatedness of leadership and sustainability development and the importance to include both for successful competency development. It was evident that participants with a strong leadership identity were more easily able to identify

sustainable competencies within themselves. Adding a component of leadership training when introducing and developing these competencies in leaders may help to foster sustainability-leadership skills, as well as empower the individuals to utilize the competency to solve sustainability-related challenges.

All in all, with the growing demand to put our world on a more sustainable path, it is anticipated that these findings can better equip educators and leadership trainers on better methods to introduce and develop the personal competencies needed for progress in sustainable development. By leveraging an individual's personal experience and evaluating their problem-solving skills on sustainability-related challenges, one may find more success in introducing and developing sustainability-leadership skills. Although these findings will not solve the challenges associated with sustainable development, they may play a part in helping to advance the leaders who can.

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Academic Vita – Juliana Dominick

Education and Honors

The Pennsylvania State University, Schreyer Honors College — **University Park, PA**
Major: Biomedical Engineering | Minor: Engineering Leadership Development — *Class of 2023*

Work and Research Experience

Genentech — **San Francisco, CA**
Cell Culture and Bioprocess Operations Intern — *May 2022—August 2022*
- Performed upstream 250mL-2L cell culture operations (media batching, inoculation, feeds/additions, harvest) and maintained calibration of necessary analyzers and equipment
- Created a scale-down filter model for pilot-scale testing of ATF perfusion intensification system
- Designed management system for consumables of single-use technology and communicated changes to project teams

B. Braun Medical Inc. — **Allentown, PA**
Product Development Intern — *May 2021—August 2021*
- Utilized design controls and cGMP to lead testing efforts for a new medical device
- Supported design of experiments and data analysis of nine tests
- Facilitated weekly meetings with Manufacturing, Quality, Material, and Biocompatibility teams to align goals and expectations

Sheikhi Research Group — **State College, PA**
Undergraduate Research Assistant, Department of Chemistry — *August 2020—December 2021*
- Performed experiments by following operating procedures and existing literature
- Collaborated with graduate research students during meetings each week regarding lab progress and future work

The Pillar Foundation — **State College, PA**
Leadership Development Research Intern — *August 2021—Present*
- Design and execute leadership development webinars for young leaders in developing countries
- Analyze qualitative and quantitative data from webinars to improve education practices and future webinars

Leadership and Activities

Engineering Leadership Development Courses — **State College, PA**
Student — *May 2020—Present*
- Collaborate on team projects to gain knowledge on the design process and project management
- Evaluate team progress via Work Breakdown Structures, SPI/CPI, and Cost-Benefit Analysis
- Present Weekly Status Updates and receive feedback from university alumni

Thermodynamics in Biological Systems — **State College, PA**
Teaching Assistant — *August 2022—Present*
- Provide weekly office hours and 1:1 tutoring sessions to review course material
- Design exam review sessions with the professor and hold sessions for 130+ students

Atherton Hall Leadership Council — **State College, PA**
Sustainability Chair — *September 2019—March 2021*
- Strategized methods alongside Residence Life Coordinators to decrease environmental footprint of Atherton Hall
- Motivated students through a sustainable development initiative, resulting in a 23% reduction in water usage and 18% reduction in electricity consumption within 3 months

Publications and Conferences

Pitcher, M. L.; Huntington, B.; **Dominick, J**.; Sheikhi, A. Highly Functional Bio-Based Micro- and Nano-Structured Materials for Neodymium Recovery. *Chemical Engineering Journal.* 2022, *447* (June).

Dominick, J., Park, M., Choe, N.H., & Park, J.J. (2022. April). A New Vision for Leadership Development for Sustainable Development Through the Interconnection of Leadership Identity and The UN 17 Sustainable Development Goals, Paper presented at 2022 National Consortium for Instruction and Cognition meeting, San Diego, CA, United States.