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UNIVERSITY OF SOUTH DAKOTA FACULTY AND STUDENT PERSPECTIVES
ON SUSTAINABILITY EDUCATION

By

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Abstract

UNIVERSITY OF SOUTH DAKOTA FACULTY AND STUDENT PERSPECTIVES ON SUSTAINABILITY EDUCATION

Morgan Hughes

Director: Dr. Meghann Jarchow

The concept of sustainability is taught and understood in multiple ways, and how one perceives sustainability is likely to affect how they engage with the field. This thesis research focuses on sustainability faculty and undergraduate students at the University of South Dakota and how they perceive sustainability education. I conducted semi-structured interviews to determine faculty and student perspectives regarding sustainability, sustainability education, and the undergraduate sustainability curriculum at the University of South Dakota. There are many different ways to approach sustainability such as content knowledge, systems thinking, and an interdisciplinary approach. Overall, the perceptions of sustainability education from the participants were cohesive and aligned well. The participants sustainability definitions aligned with the Brundtland Commission definition and the widely acknowledged “three pillars”. Climate change and resource management were identified as common issues within the field of sustainability. A mix of many different curricular styles and structures such as the interdisciplinary approach and content matter including understanding the earth’s systems and climate change were shared as valuable pieces of sustainability education. Currently, these styles, structures, and content matter are reflected in the undergraduate sustainability curriculum at the University of South Dakota. However, based on feedback from the interviews I provide possible improvements for the sustainability undergraduate curriculum including class offerings, expansions within the Department of Sustainability & Environment, and creating a more navigable catalog.

Key Words: sustainability, education, undergraduate sustainability, sustainability program

Table of Contents

Introduction	Page 1
Methods.....	Page 6
Study Site	Page 6
Interviews	Page 7
Participants	Page 8
Data Preparation and Analysis.....	Page 9
Results.....	Page 10
Concepts of Sustainability.....	Page 10
Sustainability Education	Page 13
Sustainability at The University of South Dakota.....	Page 15
Discussion	Page 18
Conclusions	Page 21
Appendices	Page 23
Appendix A	Page 23
Appendix B.....	Page 24
Appendix C.....	Page 25
Appendix D.....	Page 26
Appendix E	Page 27
Work Cited	Page 28

List of Figures

Table 1	Page 9
---------------	--------

Introduction

Sustainability is a relatively new field, especially as an academic area of study. In 1987 the Brundtland Commission of the United Nations within their report titled Our Common Future defined sustainability as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland Commission, 1987). Sustainability is also commonly discussed as having three pillars: environment, society, and economy. Additionally, there are different definitions of sustainability. For example, when focused more on the environment pillar it can be described as, “avoidance of the depletion of natural resources in order to maintain an ecological balance” (Lexico, 2022). The United Nations also developed the Sustainable Development Goals (SDGs), which provides seventeen global goals for all countries (United Nations, 2015). The SDGs provide “a shared blueprint for peace and prosperity for people and the planet, now and into the future” (United Nations, 2015). The goals incorporate environmental goals such as combatting climate change and caring for wildlife, but the goals also focus heavily on the society and economy pillars of sustainability (United Nations, 2015). Having work for all and economic growth are examples of goals that relate to the economy pillar. Goals that relate to the social pillar include no poverty or hunger and providing everyone with good healthcare and education (United Nations, 2015). There is also a behavior component to the society pillar. For example, the goal of responsible consumption and production will vary based on the nation’s development (United Nations, 2015).

Regardless of differing definitions of sustainability, higher education can play an important role in advancing sustainability awareness and action (National Academy of

Sciences, 2020). Development of different approaches that all address the same core concepts through problem solving and long-term projects can strengthen sustainability education (National Academy of Science, 2020). A key step in the development of curricula is to recognize core competencies for the field of sustainability. A competency is defined as “a functionally linked complex of knowledge, skills and attitudes that enable successful task performance and problem solving” (National Academy of Sciences, 2020). Identifying the core competencies aids in acknowledging desired learning outcomes, preparing students for their future careers, and aligning sustainability curricula with needs of employers (National Academy of Sciences, 2020). Content knowledge is also important in sustainability education and developing competency. Students should be presented with a range of overview and specific material that incorporates both problems and solutions (National Academy of Sciences, 2020). An understanding of these core competencies prepares students to face interdisciplinary issues (National Academy of Sciences, 2020). As sustainability continues to emerge and reach a wider group of individuals, sustainability education will continue to gain more support and interest. Moving forward, federal assistance and more research opportunities would help assist the growth and development of sustainability education (National Academy of Sciences, 2020).

Each university’s undergraduate sustainability curriculum has unique elements that shape their program. I use *curricular style* to describe the different elements such as the structure of a curriculum. Each curricular style or structure has unique desired outcomes for students such as an understanding of the scientific knowledge or acquiring problem solving skills. The structure of each curriculum influences the available student

opportunities such as the incorporation of hands-on research. Examples of these different styles include an interdisciplinary approach, futures thinking, problem solving frameworks, and implementation. There are also components to an effective curriculum that are not stand alone which include systems thinking, content knowledge, and frameworks. These components differ from curricular style because they are not a complete approach to sustainability education. Rather, they are important pieces that can be found in more than one curricular style. For example, all approaches to sustainability education should have some component related to content knowledge, because it includes how we understand the earth, it's systems, resources, and sustainability issues such as climate change. The interdisciplinary approach, systems thinking, and content knowledge are focused on throughout this thesis as they were the most consistent with the responses brought up by the interview participants.

Sustainability is often viewed as a very interdisciplinary field, however in academia a common concern is that it can be taught as a disciplinary field with a focus mostly on environmental topics (Gaard, Blades, Wright, 2016). Fields that can be perceived as disciplinary include courses surrounding agriculture, conservation and environmental sciences (Gaard et al., 2016). In order to create a more interdisciplinary approach to sustainability, courses relating to social justice, economics, and humanities should also be explored within the curriculum in addition to courses with an environmental focus (Gaard et al., 2016). By teaching sustainability with an interdisciplinary approach students graduate better equipped to tackle multifaceted problems.

Bemidji State University's Indigenous Sustainability degree is an example of an interdisciplinary degree. Students are required to take general education courses, sustainability courses, and Indigenous sustainability courses. After that students have fifteen electives to fill as they would like. Students are able to take more classes relating to the environmental, social or economic pillar of sustainability. The options that students have regarding the broadness of their education combined with the required environmental and social material makes this degree an example of how sustainability education can follow an interdisciplinary framework (Bemidji State University, 2022).

An important component to an effective sustainability curriculum is systems thinking. The University of Wisconsin-Madison defines systems thinking as:

The study of complex integrated systems in nature and society. It is a framework by which one can analyze and describe any group of objects or actors that work in concert to produce some result. It is the art of seeing the world in terms of wholes and the practice of focusing on the relationships between the parts of a system (University of Wisconsin-Madison, 2022).

Systems thinking is unlike a more linear approach and addresses more than just cause and effect because it recognizes complexities (Ndaruhutse, Jones, Riggall, 2019). This method aligns well with sustainability education because sustainability issues are often very complex. Instead of looking at only cause and effect it makes sense to address other parts of the larger picture. Systems thinking can lead students to learn more about the causes and the complexity of not only the problems but also the possible solutions (Ndaruhutse, et al., 2019). The University of Glasgow in the United Kingdom offers a systems thinking course focused on climate change. The course focuses mainly on decision making tools related to personal life and the workplace that students can use to make positive strides regarding climate change and sustainability. The goal of the course

is to help students create connections regarding how the different components of the earth's systems, social issues and the economy interrelate using theories and tools such as discussion and evaluating case studies (University of Glasgow, n.d.).

The specific content knowledge is a very important component to any curriculum. Instead of describing a way of thinking, it suggests that students need all the information on the topic. Content knowledge includes all of the core knowledge needed in order to succeed within a discipline (Kagan, 2020). Sustainability content knowledge could incorporate an understanding of the earth's history as well as pressing issues including climate change and over consumption, and their relationship to other topics such as economics, public policy, and social injustices.

Currently, the undergraduate sustainability degree at the University of South Dakota contains content knowledge, systems thinking, and the interdisciplinary approach. The curriculum includes requirements for undergraduate research or internships, lecture-based courses, and lab-based courses where there are many learning techniques encompassed. This allows students to gain content knowledge, gain problem solving skills and better understand the interdisciplinary nature of sustainability. The degree is administered through the Department of Sustainability & Environment, but there are many courses throughout the program that are taught by affiliated faculty whose home departments are across the university. This mix of opportunities allows for undergraduate students with sustainability degrees from the University of South Dakota to graduate with content knowledge as well as interdisciplinary skills and the ability to recognize the complexity of issues which aligns with the goals of systems thinking (The University of South Dakota, 2022). Undergraduate sustainability students are able to determine the

specificity of their degree by choosing an Environmental Science or Human and Natural Systems specialization and a minor (The University of South Dakota, 2022). Within each specialization there are elective classes that cater to more specific topics within that area of sustainability. There are also other credentials such as the geospatial analysis certificate and sustainability in business certificate that students can obtain alongside their degree (The University of South Dakota, 2022).

I had three objectives while completing this research:

1. To document sustainability student and faculty members' understanding of the concept of sustainability,
2. To explore recommendations from sustainability faculty and students regarding how sustainability should be taught at the University of South Dakota, and
3. To provide recommendations on how to improve the undergraduate sustainability degree at the University of South Dakota

Methods

Study Site

The sustainability program at the University of South Dakota began in August 2012, and the graduate program was added in August of 2018. As of Fall 2021 there were 34 undergraduate sustainability majors, 11 master's students, and 3 PhD students (Coyote Connections, 2022). The Department of Sustainability & Environment has 6 departmental faculty members and 22 affiliated faculty members with areas of study including biology, economics, political science, history, and chemistry (University of South Dakota, 2021).

Interviews

I used semi- structured interviews to gather information about participant demographics, their understanding of sustainability, their experiences in sustainability, and their thoughts on sustainability education. Appendix A shows the questions I asked to undergraduate sustainability majors, and Appendix B shows the questions asked to sustainability faculty members. I would ask follow-up questions to the participants on an as needed basis. After review by the Office of Human Subjects it was determined that I did not need to submit this research for review by the Institutional Review Board (IRB). All of the interviews were conducted virtually using the Zoom software which provided closed captioning and automatic transcription. At the start of each interview, I first asked for verbal consent that the participant consented to the interview being recorded. Participants were labeled Student A-G and Faculty A-E in order to keep the identities of the participants confidential.

Due to a technical issue regarding the hard drive on the departmental laptop being used, interviews and transcripts from eight participants were lost. Two faculty members and four students repeated the interview. Students A, B, F, and E and Faculty B and D repeated the interview. The data presented is from the second time conducting the interview with these participants. One of the faculty member interviews was from a pilot, which had slightly different questions (Appendix C).

Participants

Dr. Meghann Jarchow, Chair of the Department of Sustainability & Environment invited individuals to participate via an email. In order to be asked to participate individuals needed to be an undergraduate sustainability major, graduate student that completed their undergraduate in sustainability from the University of South Dakota, or professor within or affiliated with the Department of Sustainability & Environment. Interviews were less than one hour and participants were offered a \$20 gift card for participating in the research. The results presented are based on the interviews of seven students and five faculty members (Table 1).

Table 1: Participant Demographics

Participants	Sustainability Students	Sustainability Faculty
Areas of Expertise	<ul style="list-style-type: none">- Political Science- Economics- Biology- Communications- International Studies- Marketing- Business- Conservation and Biodiversity- Chemistry	<ul style="list-style-type: none">- Biology- Ecology- Chemistry- Earth Science
Gender	3 Female 4 Male	2 Female 3 Male
Age Range	19-22	35-55

Data Preparation and Analysis

Recordings of each interview were downloaded onto a laptop. The transcripts were lightly edited to improve readability and were saved as clean verbatim transcripts which were used for data analysis. The transcript documents were then used to code and analyze the responses. I used a deductive coding method, which means that the codes were predetermined, and then looked for in the transcripts (Delve, 2009). I developed the codes that I used based off of my objectives, but my codebook was not developed until after the interviews were complete. I had a code for concepts of sustainability, desired outcomes of sustainability education, comments specific to USD, and any proposed solutions. I also recorded any outliers or any other interesting information in my Excel sheet. A further breakdown of my codes can be found in Appendices D and E. Within the sustainability education-related questions, I grouped the answers mainly based on scientific knowledge and other portions of sustainability education that I classified as skills such as problem-solving skills or experience. The content knowledge portion of the participant answers was categorized as anything I found to be “textbook knowledge” such as how a system works or factual information. The other answers were classified as skills and encompassed anything related to a physical action, use of a technique, or anything that would be carried out by the student, such as communication skills or remote sensing experience. The data was organized using an Excel spreadsheet where I kept a record of responses that related to the participants concept of sustainability, desired outcomes of sustainability education, information or feedback specific to the undergraduate sustainability program at the University of South Dakota. Any comments that were very different than other answers or the expected answer or offered feedback regarding

undergraduate sustainability education at the University of South Dakota were also recorded. The Excel sheet was very helpful in creating my qualitative statistics, and provided a place to record direct quotes that I wanted to include in my thesis.

Results

Concepts of Sustainability

The ideas and values regarding the concept of sustainability were fairly uniform from both the sustainability students and faculty. When asked to describe sustainability the responses included the widely accepted definition from the United Nations Brundtland Committee. For example, Student E said “Studying how we as people on the planet can live here for forever, and live here with having good, healthy, fruitful lives because the way that we're going now we're severely compromising that ability”. However, aside from that there were three of seven student participants that used environmental science as a way that they would describe sustainability. For example, Student F commented, “I just tell them it is kind of, like, environmental stuff, like, environment science because that is kind of the easiest for them to understand because a lot of people do not know what sustainability is”.

During the interviews five out of seven students stated that climate change was one of the largest issues if not the largest issue in sustainability. Student C also elaborated as to why it was important to them,

Climate change is just by looking at ski resorts you can look at the opening and closing resort dates of every year, and it's like their opening length is shorter every year, and so climate change is a major factor in that. I just grew up skiing, and every year I was like, ‘Oh I used to ski early December now it's January, and it's closing earlier so climate change definitely plays a role’ and so on. It's just always been of great importance to me.

On the other hand, none of the faculty used climate change as the sole answer to this question. In fact, only two of five faculty members mentioned climate change when asked about sustainability issues, and both of them had other answers as well. Faculty B stated,

Yeah, I think for sure climate change. I mean, but I don't know - I mean, I feel like that's going to be a huge problem in our lifetime, and also, I just think waste, in general. Right? Like, food waste, single use products, like, all of those things, industrial waste that that we just take for granted that we can afford to throw things away.

Aside from waste and climate change another popular answer from faculty members was limited resources. The most mentioned was water. Faculty A said,

I mean water is one major thing that comes to mind, and also, unsustainable use of natural resources. Of course, water is one of them... and also, since we are in the east, we are East River, sustainability in agriculture, because all these things hit home.

While answering the question about the most concerning sustainability issue from their perspective Faculty D had a very different answer and commented about a lack education and communication regarding sustainability. They commented “I have a fear. I think that sustainability will just become a fancy way of saying environmental science, which then ignores a lot of what sustainability is, a lot of the social side of it”.

When asked about changes in the participants’ concept of sustainability over time, the students were asked about changes they have noticed over their time at the University of South Dakota, and faculty were asked about changes that they have seen over their career. A common answer among students was that their concept of sustainability has changed. Most came to study sustainability because they were interested in the environmental portion of the degree, and as they entered into the introductory classes,

they realized how much more there was to the field of sustainability. Here is Student A's perspective:

I definitely have. I mean when I came in I knew that I liked the sustainability program here because it wasn't just environmental studies. I liked that. It seemed too beyond that, but my specific interest was still the environment. That was what I was most passionate about, that was the career I really wanted..., but I liked that holistic view. [While Student A came to the University of South Dakota with a strong interest in the environment pillar of sustainability.] Over time though I've definitely become more interested in the purely social aspect, and you know how do we make communities better not just environmentally but just socially? How do we make sure people have jobs where they need them, and how do we make sure people can really just get the life they want to live?

When asked what prompted this change, most students answered regarding the introductory courses Sustainable Environment (SUST 113) and Sustainable Society (SUST 111). Student D spoke specifically about Sustainable Environment, "I think Sustainable Environment class did a little bit because [the instructor] really emphasizes stakeholders, and how do your decisions impact different groups of people or different segments in society, which I never really thought of that much". A majority of student participants reported that their understanding of the concept of sustainability had changed over the course of their studies, and generally the students reported that their understanding became broader to include the economic and social pillars of sustainability.

The faculty's answers regarding their change in the concept of sustainability had much more variable answers ranging from yes to no. Faculty D said, "No, actually I think if anything it has been more reaffirmed over and over again, which has been nice". On the other hand, Faculty C noted,

Early in my career sustainability wasn't even a widely discussed subject at all, and so, you know, in that sense, there's a change over the course of my career,

because now it's not only a widely known and used term and subject of some societal and academic thinking, but is the name of departments and academic programs and that kind of thing, but the basic concept of sustainability as long as I've been aware of it has remained relatively constant.

Another faculty member explained how the concept has not changed, but their understanding for how sustainability can be applied to solve problems has. Faculty E answered,

I think even while I've always been a fan of what sustainability is, I think over time what has happened in terms of how I view it and teach about it is, I have a greater appreciation for how sustainability can help solve problems moving forward because of how interdisciplinary it is and how it requires thinking about more disciplines, other than just, you know, your own discipline...the traditional discipline that you study which tends to not be very interdisciplinary at all.

Sustainability Education

The desired outcomes for sustainability education were very consistent among the sustainability faculty and students. The most common answers can be separated into two groups; skills and content knowledge, as described in the methods section. Content knowledge was the most common response among the student participants, with five students having answers similar to a holistic understanding or an understanding of the environment, and hoping to be provided with real world examples. Real world examples are classified here as content knowledge because students can learn about methods and strategy, but it would not be considered a skill until they had the opportunity to implement it themselves. Student C commented, “A degree. I don't really know just; I just feel like it's just kind of all the vast knowledge that like professors tell me”. Only Student F answered regarding skills by replying they hoped to have opportunities that would prepare them for a job after graduation, “I hope that there is more opportunities around here or from the university to help us out to make sure that we are ready in the

near future for jobs”. This is classified as a skill under the assumption that the opportunities include practical experience for the students to implement the skills themselves. For example, Student F mentioned wanting to work in a water laboratory, which requires skills and experience within the laboratory setting.

Student B brought up the idea that a sustainability degree should be supplemental to something else because sustainability is so broad and interdisciplinary. Another degree allows students to increase their depth of knowledge, and have more specific preparedness when it comes to entering the work force.

Among faculty members there were two answers that had more of a focus on content knowledge and two that emphasized skills. The faculty skill-based answers included communication and empathy as well as being able to use remote sensing. This is Faculty D’s response regarding empathy,

I think it's the one most important tools you can have because at the end of the day you have to work with people, and so many of these systems we are as humans we're intertwined with them, and if you don't have empathy you can't solve any of these problems. People are going to want to listen to you and these problems require listening and empathy to make them work. So, so essential.

The content knowledge-based responses from faculty members referred to hoping that students understand how systems work together, and that they understand the consequences of using earth’s finite resources. Faculty E’s reply emphasized the need for an understanding of earth’s systems while also taking into account that it depends on the student’s specialization (referred to as track by Faculty E).

So, I think you need different things depending on which track you take. So, because clearly one is more science focused than the other. Right? Because I think the one wants to deal with people and social situations [Faculty E is referring to the Human and Natural Systems Specialization] more than the other one [referring to the Environmental Science Specialization] but regardless of that I

think you know all sustainability majors need to have, at the very least, a general understanding of the science of the environment.

Lastly, when asked what students need to be successful in sustainability Faculty C expressed that they value a balance:

You can know all the knowledge in the world..., but it is not useful in a sustainability context unless it can be put to work, and all the ability to put ideas to work is also not useful if it's founded on misunderstandings and lack of knowledge about how things work, or the nature of what the problems were facing.

Faculty C explained that there is a push for more problem solving, but they “worry about an over correction that way, to the point where people say okay well really an education in sustainability should be all about solving problems”.

Sustainability at the University of South Dakota

The questions that asked specifically about the participants’ experiences at the University of South Dakota provided two types of feedback.

Students were asked:

- What aspects of sustainability do you feel that the professors who teach your sustainability courses emphasize?
- Do you think that sustainability is taught similarly among your sustainability courses?

The faculty participants were asked:

- What aspect (s) of sustainability do you hope your students learn from your class?
- How can you tell the students are grasping the skills and concepts?

- What do you think is the biggest challenge for students to learn these skills or concepts?

Overall, the feedback from the students about their classes and professors was very positive. When asked if sustainability was addressed similarly in their classes most of the students said “no”. Student B elaborated,

It really depends. I think there aren't a ton of like sustainability courses in the sustainability prefix. Most of those, like, you know, the sustainability intro courses, those sort of try to focus on every aspect of it, but then most of the degree I think is made up of, like, biology or political science or these other things, and I think those sort of tend to focus on their own area, being like the environment for biology or science courses and then you know the social and political side of things and others.

There were two students who acknowledged how all of their classes start with the broad basics of sustainability and then become more specific.

I think so because I think they've all acknowledged that sustainability is broad. It has those three pillars, and they are mentioning each of those three pillars. They're not just focusing just on the environment or something, and I think they tend to identify similar problems like kind of in the last question mentioned stuff like pollution or like environmental regulations I mean that seems to come up quite frequently and then the conversations around solutions. I feel like that's common in classes of, like, what can we do about these different problems (Student D).

Three students commented that each class has a unique focus, or that each professor has their own focus. Student F commented “You know one of them talks about rocks, the other one talks about society, and one talks about more the environment so I feel they can vary but I feel like different, and I like that.”

Throughout the interviews both faculty and students suggested possible improvements to be made to the undergraduate sustainability degree. A common improvement suggested by both faculty and student participants was more collaboration with other departments within the sustainability program, as well as the Department of

Sustainability & Environment. One example presented regarding the sustainability program by Student A was, “if I took an econ[onmics] class and then there was a lab or something offered that was a sustainability focus”. This would allow students to dive deeper into how the business content related to sustainability.

Collaboration with other departments would also allow the Department of Sustainability & Environment to expand despite their limited physical space. Faculty D commented on the limited space in the department, “Yeah, so my dream solution would be a building, but I think the more feasible solution is ... using the resources we have on campus which isn't necessarily a bad thing. I think sustainability is so broad that it could be really interesting to have someone [trained in] sustainability in the business office [referring to the business school]. Someone over there and bringing those elements that could be very cool”.

Another suggested improvement regarding the overall navigation of the undergraduate sustainability degree included making sure that the class catalog is set because what is listed is not always what is offered on a regular basis. Other improvements included more technical or hands-on courses being offered throughout the degree.

The faculty members were identified as an existing strength of the sustainability program by two participants. Student D commented,

I think all the professors in the department are really great, and they care about their students and their success, and they are kind of willing to go above and beyond. They're willing to talk more in depth about concepts or go beyond. They're willing to go the extra mile because I think they're so passionate about it and really, it's kind of a niche group. So, I think they get excited when people show interest.

Student E commented about being pushed out of their comfort zone by professors, and that learning from that discomfort was a very positive experience.

Discussion

Throughout this research I was able to evaluate student and faculty perceptions of the concept of sustainability. I found that although there were many commonalities among their definitions, students were more likely to use environmental science to define sustainability. While three of seven students used environmental science as a way to define sustainability, one faculty member expressed concerns about sustainability becoming a fancy term for environmental science. The student response of describing sustainability using environmental science validates the faculty member's concern of the two becoming interchangeable. This is a common issue because environmental science is part of sustainability. Environmental science is an interdisciplinary field that draws on biology, ecology and meteorology to study the impacts of humans on the environment (Kte'pi, 2018). On the other hand, sustainability focuses on how to live within the means of the earth without significantly impairing the earth's function. While environmental science is an important piece to sustainability, it is balanced with social and economic factors as well. The three pillars can be used for people to better understand the limits of the earth and how to stay within them. Sustainability is such a broad field that it can be difficult to give everyone a thorough definition, but it is important that students leave the University of South Dakota equipped to understand and explain why sustainability is different than environmental science.

Five out of seven students mentioned climate change as an important issue, but fewer elaborated on why or what interested them or worried them about it. Some faculty

members mentioned climate change, but it was mixed in among other topics, and a much less prominent answer. While conducting interviews, it appeared as if climate change could be an emerging foundational concept for the younger generation surrounding sustainability. This is consistent with research that has been done surrounding the topic. The Pew Research Center found that Generation Z (born after 1996- which encompasses all of the student participants) and Millennials have very high levels of engagement regarding climate change (Tyson, Kennedy, Funk, 2021). The research found that while the percentage of voting individuals are higher in older generations, 32% of Gen Z has taken an action to address climate change in the last year, such as donating money or contacting an elected government official (Tyson et al., 2021). Only 23% of Generation X (age of other faculty that are not Millennials) reported taking action against climate change (Tyson et al., 2021).

Throughout this research I found that overall students and faculty members felt that the sustainability education at the University of South Dakota is effective at integrating both content knowledge and skill, even though students tended to express more of a desire to gain knowledge. Knowledge could have been the more popular answer because acquiring content knowledge is usually the first thing that comes to mind for most people when discussing obtaining a degree. Also, often in higher education content knowledge may seem more important because it is often emphasized through most universities testing and grading systems.

Sustainability's versatile nature is unique, and it can serve as a standalone degree, but some supplementation of other content knowledge can enhance the degree. Student B noted during their interview that sustainability should be supplemental to other degrees,

not stand on its own. Central College's commitment to being a liberal arts university can be used as an example of how to implement this. Within every student's time at Central College, they must complete what is known as the "core" (Central College, 2022). The core contains five topic areas: integrative studies, disciplinary studies, global sustainability, global perspectives, and writing intensive. Within this structure it guarantees that all graduates of Central College will have a basic level of sustainability education, which they can apply to their specific area of study (Central College, 2022).

The research presented in this thesis could be implemented on other individual universities as well as to use them as a compare their programs to each other. The undergraduate sustainability degree at the University of South Dakota requires students to have at least a minor to graduate with sustainability. Ideally, this would be enough to help students narrow down a direction with their degree. Comparing students' degrees, whether it be sustainability and a minor or sustainability and another major, to the employment statistics after graduation could provide more information on this. Depending on the outcome, it could imply that sustainability acting as a supplemental degree would improve the University's after-graduation employment statistics.

Overall, the undergraduate curriculum at the University of South Dakota aligns well with the desires that students and faculty have regarding sustainability education. Many students answered that sustainability is not taught uniformly throughout the major. This allows students to acquire different views of sustainability in each of their classes. It is an accomplishment for the undergraduate sustainability degree to be able to provide what the students see as a well-rounded education by touching on all three pillars of sustainability within the program.

The interdisciplinary nature of sustainability makes it possible to relate it to almost all fields studied in higher education. While interdisciplinary studies can be a good thing, they are much harder for universities to implement well (National Academy of Sciences, 2020). The University of South Dakota incorporates this into the undergraduate sustainability degree by having faculty from many departments across campus. Other suggestions made in the National Academy of Science consensus report were to incentivize collaborative teaching, and to train faculty on the importance of interdisciplinary study (2020).

Participants also brought up strategies to improve and provide more cohesion with other departments such as the business school, chemistry, and computer science. These suggestions lined up with those made in the National Academy of Sciences consensus report, where the committee suggested team teaching between departments and developing a diverse team of departments (2020). More collaboration across campus would allow for students in the undergraduate sustainability program to look more closely at sustainability within their interests. However, it may not need to be a new class. It could be adding a lab or a unit to a preexisting course that helps students learn to apply the material. It also provides a small amount of sustainability knowledge to other majors on campus when they take sustainability related classes to fulfill electives.

Conclusions

Data collection similar to this could be done to compare different universities, programs, and places. Based on how the faculty across different universities conceptualize sustainability, there could be a regional component to their answers as well. Sustainable solutions are not one size fits all, and interviewing sustainability related

individuals in different areas may reflect the issues unique to their location. For example, Student A mentioned that the most concerning sustainability issue was the nitrate pollution in Iowa. An interviewee from another region most likely would not have the same response.

Another possible next step would be having more participants from the social sciences and humanities. The student participants were fairly well rounded with areas of expertise that incorporated all three of the pillars of sustainability. However, the faculty participants exclusively natural scientists even though all faculty members affiliated with the sustainability program were invited to participate in this research. Adding the perspectives of social science and humanities faculty members would enrich the understanding of faculty members' perspectives of sustainability and sustainability education.

Overall, the perspectives of sustainability concepts, sustainability education, and sustainability at the University of South Dakota are cohesive with the program. Both the undergraduate curriculum and the sustainability faculty and students care about understanding and applying the three pillars of sustainability. Participants also valued the interdisciplinary nature of sustainability. The important elements discussed in this thesis are present in the University of South Dakota undergraduate sustainability degree, by continuing to add more interdisciplinary content, systems thinking, and content knowledge the perspectives of sustainability faculty members and students will continue to further align.

Appendices

Appendix A

Sustainability Students

Age and gender?

What year are you here at USD?

What is your minor (s) or other majors?

- How do you think _____ relates to sustainability?
- Do you see any similarities between your major / minor (s)?

What do you plan to do with your degree?

- What do you think you need from your education to be successful within that career?
 - o Why do you think this?

Are there any classes that you specifically enjoyed?

Are there any specific areas of sustainability that interest you?

What sustainability issue is most concerning to you?

When you tell people about studying sustainability, what sort of concepts do you mention?

- How has your concept of what sustainability been changed during your time at USD?
 - o Was there a specific experience or course(s) that prompted this change?

What aspects of sustainability do you feel that the professors who teach your sustainability courses emphasize?

- Do you think that sustainability is taught similarly among your sustainability courses?
 - o How do they differ or the same?

Appendix B

Sustainability Faculty Members

Age and gender?

What do you teach here at USD?

What is your area of study?

What classes do you teach in the sustainability major?

- Are there any sustainability classes or course material you particularly enjoy teaching?

What sustainability issue is most concerning to you?

What professional experience do you have outside of the field of sustainability?

- How does _____ relate to sustainability?
- Do you notice any similarities between the content of the two?

How would you describe sustainability?

- How has your concept of sustainability changed during your career?
 - o Was there a specific experience that prompted this change?

What does a student need to have to be successful in the field of sustainability?

- Why do you think this?
- How can we increase this?

What aspect (s) of sustainability do you hope your students learn from your class?

- How can you tell the students are grasping the skills and concepts?
- What do you think is the biggest challenge for students to learn these skills or concepts?

Appendix C

Sustainability Faculty Pilot Questions

Age and gender?

What do you teach here at USD?

What is your level of education and area of study?

Are there any sustainability classes you particularly enjoy teaching?

What sustainability issue is most concerning to you?

Have you had any professional experience outside of sustainability?

- How does _____ relate to sustainability?
- Do you notice any similarities between the content of the two?

How would you describe sustainability?

- How has your concept of sustainability changed during your career?
 - o Was there a specific experience or subject matter that prompted this change?

What does a student need to have to be successful in the field of sustainability?

- How do you know?

What aspect of sustainability do you hope your students learn from your class?

Do you see students grow in these skills or concepts by the end of the semester?

Appendix D

Concepts of Sustainability

- Any definitions of sustainability
- Concerns within sustainability
- How the participants concept of sustainability has changed over time.

Desired Outcomes

- What student participants want to learn
- What the faculty member participants want students to take away

USD Specific

- How sustainability is taught at the University of South Dakota
- Anything that is emphasized from the student perspective within their courses
- If instructors try to emphasize anything in their courses

Solutions

- Any improvement recommendations made by participants

Outliers

- Any comments I found note worthy that were not consistent with other answers or far from expected.

Appendix E

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1		STUDENT		Concept of Sustainability			Desired Outcomes			USD Specific			Outliers			Solutions			Other		
2		A																			
3																					
4																					
5		B																			
6																					
7																					
8		C																			
9																					
10																					
11		D																			
12																					
13																					
14		E																			
15																					
16																					
17		F																			
18																					
19																					
20		G																			
21																					

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