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Project Report

Participatory Development of Key Sustainability Concepts for Dialogue and Curricula at The Ohio State University

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Abstract: The Ohio State University (OSU) is one of the many universities committed to sustainability within its operations, traditions, and university framework. The university continues to evolve in relation to its sustainability goals, and currently seeks to both build on and deepen the culture of sustainability at OSU. One way to do this is through increasing the sustainability literacy of students on campus, by creating an introductory sustainability curriculum, which would put forth the definitions, concepts, and initiatives that represent sustainability at Ohio State. However, before such a curriculum can be developed, it is important to first understand the current sustainability perceptions at OSU: what definition does the university want to embrace? What is most pertinent to teach OSU students? Twenty sustainability leaders across the university were interviewed in a participatory development process to produce consensus-based, local definitional concepts that are not only beneficial for student knowledge, but for OSU sustainability progress as a whole. The results of their recommendations have provided a solid framework from which the university can build in its future curricular efforts, and provides insights that may be particularly helpful in promoting sustainability in other large American universities. This study also describes a case of using participatory development (PD) methods, which have been under-utilized in a higher education setting, particularly in sustainability implementation.

Keywords: sustainability; sustainability education; sustainability curriculum; sustainability in higher education; participatory development

1. Introduction and Background

1.1. Introduction

Universities worldwide are increasingly incorporating sustainability into their operations, outreach, management, reporting, and curricula [1–3]. Historically, research on university sustainable development (SD) has been more focused on operations and campus management than on curriculum development [1,4,5]. However, in the last decade, the number of universities that have incorporated sustainability into their curricula has risen [2,6,7]. Specific case studies describing the challenges, successes, and recommendations of universities undertaking such curricular change have been widely documented [1,2,6–12]. Reviews of the literature have provided additional insight into university experiences with SD in the curricula [13,14], including Lozano and colleagues' recent worldwide survey of university sustainability programs [15]. Much of this analysis, however, has focused on European institutions, and very little of the literature documents the experience of a university like Ohio State: a large, Midwestern university that is demographically representative of the United States.

This study explores the successes and challenges of sustainable development at Ohio State, and provides insights that may be particularly helpful in promoting SD in other large American universities. This study also provides a case for using participatory development (PD) methods, which have been successful outside of the university context, but under-utilized in a higher education setting, particularly in sustainability implementation [16]. PD methods can add to our understanding of promising models for larger universities where sheer size and scope present challenges to implementing sustainability goals.

The surprising success of the participatory research process reported here in catalyzing sustainability dialogue, curricula, and university-wide goals at Ohio State, in fact, may suggest that participatory methods can be particularly effective in larger and accordingly more complex institutions. Implementation and success of sustainable development in universities varies depending on institutional context and culture. Different universities use different approaches to curricular change, ranging from coverage of environmental issues in an existing course, to developing an entire undergraduate or graduate program focused on sustainability [2]. Similarly, the process for creating and developing these educational tools varies—from top-down approaches to entirely student-run. The differences in implementation are likely due to different cultures and contexts—and larger universities are more likely to have multiple cultures with varying degrees of overlap and exchange. Such cases provide all the more reason to carefully explore the sustainability concepts and contexts of a large institution through participatory processes that engage collaborators across multiple sub-cultures and disciplinary units. Through such a process, the participatory development methods of this study directly led to several developments of university sustainability culture, curricula, and goals.

1.2. Background: A Brief Project Overview

The Ohio State University (OSU) has received growing recognition in recent years for its sustainability accomplishments. OSU has received the Enviance Award for being a "national champion" of sustainability, an award that deems OSU's environmental program the strongest in the nation, and OSU was named national Game Day Champion in both 2011 and 2012 for a nation-leading

stadium Zero Waste program. From the Zero Waste stadium to several sustainability student organizations to the formation of the President and Provost's Council on Sustainability, it is evident that concern for sustainability is growing throughout the university.

Most recently, OSU has been moving towards increasing attention to sustainability in the educational experience as well. This is a trend gaining traction worldwide: many institutions are beginning to require some aspect of sustainability in their curriculum [2], and several associations have been formed in support of this trend towards sustainability education (for example, University Leaders for a Sustainable Future). OSU currently has several sustainability courses, a sustainability-focused major, and other opportunities for inclusion of sustainability in the curriculum. However, OSU does not currently have an operational definition of sustainability, nor a university-wide understanding of what sustainability means to Ohio State specifically. This lack of a local definition makes it difficult to effectively communicate sustainability to students, and as a result, sustainability education at OSU is fragmented, specialized, and varied. This is a problem well-recognized in the literature: without a shared understanding of sustainability, SD integration into higher education can be challenging [13], and has been found to block academic engagement [4]. Thus, as OSU becomes increasingly involved in sustainability education, the need to define the term and the concepts associated with it grows in urgency.

In response to this need, and as an attempt to deepen the sustainability culture at OSU in general, the OSU Office of Energy Services and Sustainability (ESS) proposed the creation of a sustainability education module, which would identify a sustainability definition to be embodied by Ohio State, and would encompass all of the most important tenets of sustainability at Ohio State, emphasizing areas of environmental, fiscal, and social stewardship. In addition to providing an accessible, foundational knowledge of sustainability to the OSU community, the module will provide an overview of the many different sustainability initiatives at OSU, in order to provide students with a current vision of sustainability at Ohio State. In the context of this particular research project, the educational module being suggested is referred to as a "sustainability curriculum". This curriculum could take many forms; for instance, ESS suggested it be somewhat of a sustainability crash-course (single, short, voluntary, online, and focused on introductory sustainability concepts—perhaps as a part of orientation). Regardless of the form eventual curricula would take, the more pressing question is: "*what should be in such a curriculum*"?

Thus, the objective of this research was to identify the multiple sustainability definitions, goals, projects, and potentials which are prioritized by sustainability leaders at OSU. The research spanned a diversity of mandates and perspectives, and engaged OSU sustainability stakeholders and leaders in an iterative, participatory process in which they proposed and refined concepts that they believed should be included in a curriculum. It is important to acknowledge that the research reported here does not deliver a final curriculum—rather, it was the first step in the process of distilling a collectively recommended structure and basic content for a sustainability curriculum, which provided the university with a well-informed framework for its curricular efforts in the future. This research helped probe the deeper questions within the sustainability conversation, and produce consensus-based, local definitional concepts that are not only beneficial for student knowledge, but for OSU sustainability progress as a whole.

This project already has had a significant impact on several curricular and organizational sustainability initiatives at the university. While the goal of the research was to inform curriculum

development, the PD method sparked the development of two other educational/curricular projects that partially filled that niche and continued to expand the campus dialogue: the research process contributed to a video about defining sustainability at OSU, and also partly informed the development of a first year student seminar about sustainability in Autumn 2014. Over a year later, the results of this study continue to enrich and enhance the sustainability conversation at OSU, as they have been referred to by members of the President and Provosts Council for Sustainability in the development of official university sustainability goals. This demonstrates that the use of the PD method was successful in sparking progress and conversation at OSU, and provides incentive for other universities with a similar profile to consider PD methods in their approach.

The following sections will describe the need for a sustainability curriculum, as well as the process for gathering perceptions and values of key sustainability stakeholders at the university to inform that curriculum.

1.3. Background: Exploring Current Sustainability Culture at Ohio State

Researchers in the field of sustainability in higher education suggest that before any meaningful change can be implemented, we must first understand the institutional culture and perspectives within which we expect change to occur [5]. This section will describe the sustainability context at Ohio State.

Ohio State is among the largest universities in the nation. With nearly 60,000 students on the Columbus campus alone, the university leaves significant economic, environmental, and intellectual footprints. In recognition of this, Ohio State has been working to transform these footprints into positive impacts, and to consider the university's collective "handprint" (the environmental "handprint" is a way of measuring the positive impacts individuals make on the planet, rather than just tallying negative impacts, as most "footprint" calculations do). With the One Framework Plan [17] and countless operational improvements, Ohio State has already committed to assuring sustainable management of physical campus operations. However, OSU has also acknowledged that more than just physical improvements are needed to increase our sustainability handprint, as "OSU's greatest impact on sustainability will be to inspire a new generation of global citizens" [18]. With the complex challenges facing the world, such as those suggested by the recent release of the IPCC Climate Change Report (2014) [19], OSU's commitment to graduating global citizens who are prepared to deal with these challenges could not be more appropriate. As the IPCC report states, complex challenges will put stress on both human and natural systems—and the decisions that societies make affect the outcomes of both systems. The university increasingly is committed to providing an education that includes a robust understanding of sustainability to help graduates positively influence human and natural systems. Ohio State's commitment to global citizenry means OSU graduates are not only prepared for a job, they are prepared to be a positive force in the midst of a changing world.

In developing global citizens, Ohio State integrates sustainability into the educational experience of students in several ways. The Campus as a Living Laboratory initiative, which works to integrate campus operations into the classroom and research of the university, is one such example. This holistic integration allows students to make connections between the three realms of operations, classroom, and research, so that they have firsthand knowledge of OSU's endeavors and can critically assess sustainability at OSU from multiple perspectives.

Pertaining to the curriculum in particular, the Faculty Learning Community on Sustainability Across the Curriculum (2011), and more recently the Faculty Senate Committee for Sustainability in the Curriculum (2014), have been created in order to examine how to both infuse sustainability into current courses and how to develop new courses. Additionally, several faculty members authored a white paper, titled "Sustainability at The Ohio State University: Beyond the Physical Campus", recommending the integration of sustainability concepts into the curriculum and student experience, along with the creation of a sustainability education committee.

Sustainability in the curriculum is currently being put into practice in several areas on campus, the most notable being the recent creation of a sustainability-oriented major: Environment, Economy, Development, and Sustainability (EEDS). EEDS was created in 2012, and in just three years has become the fastest growing major at Ohio State, generating enrollment of over 150 students. EEDS is teaching a multi-disciplinary and integrated approach to sustainability, as it requires courses that span from Business Administration to Rural Sociology. In addition to the EEDS major, there is an EEDS minor, as well as over 90 areas of study in energy and related environmental issues. As of Autumn 2013, freshmen get the additional opportunity to learn basic sustainability concepts through the First Year Experience (FYE) Sustainability Series. This is a new offering inspired by both students and staff, to educate first year students on the basics of sustainability at Ohio State and ways in which they can get involved.

Despite all of these efforts towards integrating sustainability concepts into the educational experiences of students, the environmental literacy rate of OSU's student population is lower than university decision makers would like. In 2012, OSU's Environmental and Social Sustainability Lab developed and sent out an Assessment of Sustainability Knowledge (ASK) survey to the undergraduate population, in order to assess the environmental and sustainability knowledge of Ohio State students and identify areas for improvement. In addition to a series of cultural, environmental, and behavioral self-assessment questions, there were 16 questions that assessed an individual's knowledge of environmental, social, and economic conditions. These questions included topics such as sustainable development and the causes of pollution. Of the 16 questions asked, the average score among respondents (n = 1389) was 69% (with a survey response rate of 14.3%). Respondents in this study trended towards rating themselves as "environmentalist", suggesting that this level of knowledge is likely an upper bound of sustainability knowledge across all OSU students [20]. The survey was conducted again in 2013 with a few additions; however, information beyond the number of responses (n = 2621) is not yet available. Given Ohio State's commitment to sustainability, the initial score of 69% serves as a strong indicator to OSU that more work needs to be done to give students a solid understanding of sustainability concepts.

Enhancing efforts in sustainability education resonates with more than just OSU's commitment to its students; OSU has also made sustainability declarations to outside entities such as the Association for the Advancement of Sustainability in Higher Education (AASHE) Sustainability Tracking, Assessment and Rating System (STARS), which recognizes the role of sustainability efforts by awarding STARS credit to universities that employ knowledge and literacy outcome assessments [21]. OSU also participates in the American College and University Presidents' Climate Commitment (ACUPCC), an agreement signed by OSU in 2008 (and by over 600 college and university presidents since 2006) to become climate neutral by 2050. A significant portion of this commitment entails

"making sustainability a part of the curriculum and other educational experience for all students" [22]. Both entities push OSU towards higher sustainability performance by way of encouraging sustainability curricula and sustainability literacy.

Clearly, including sustainability in the educational and curricular experience of students is not a new idea for Ohio State; the university has been working towards it for years. However, these efforts are not strongly reflected in the environmental literacy and knowledge of our students. Developing a clear, uniform picture of foundational sustainability concepts at OSU is needed to increase the effectiveness of sustainability programs and the knowledge of students, faculty, and staff.

Developing a more robust definition of sustainability at OSU will also strengthen the impact of OSU's sustainability efforts as a whole. The lack of clarity in definitions across campus lends to disunity among current sustainability initiatives, and can impede involvement altogether; one OSU administrator suggested that some departments may be hesitant to engage in OSU sustainability questions/efforts due to the lack of a more serious, robust definition. It is clear that as OSU continues to build on its sustainability platform, maintaining cohesion, effectiveness, and involvement will require a more serious conversation, which explores a unified vision of what sustainability means to OSU specifically. This research addresses questions of sustainability in a responsible way, and works to better understand the culture, values, needs, and expectations surrounding sustainability at OSU, in order to improve university sustainability efforts.

2. Experimental Section

Researchers in the field of sustainability in higher education have acknowledged the importance of developing definitions of sustainability that are specific to context and place [14]. "Sustainability" may mean different things depending on the goals identified and the actors involved. Therefore, if OSU is to be most effective in its efforts towards sustainability, it is prudent that university sustainability leaders generate a better understanding of how sustainability pertains to OSU in particular, and what is most relevant to the OSU community. It is also prudent that stakeholder participation be a part of that process, as participation is seen as a pre-requisite for achieving sustainable development [23]. As such, methods in this study needed to support the process of building and summarizing a local consensus around basic sustainability concepts through participation; Participatory Development (PD) aligned well with these goals. Participatory Development, the guiding framework for this research, can be defined as "promoting the involvement of people in the planning and implementation of development efforts as well as in the sharing of their benefits" [24]. This method is seen more often outside of the university context with policy making, community development, *etc.* [16] but its application to sustainability in higher education, while previously uncommon, does seem to be growing [16]. PD has been utilized in sustainability conference meetings, workshops, and campus greening projects [16] along with more curricular-focused projects on developing sustainability criteria (in which participation was considered "vital" to the process) [25]. The successes of these projects, along with a review of the literature, suggest that PD is the most appropriate approach for integrating sustainability into the curriculum.

PD fits well with what we know about curriculum change and development. Curriculum creation is an iterative process among stakeholders that "must include brain-storming, summarizing, editing,

commenting, redrafting, *etc.*" [24]. At Ohio State, collaboration is especially important due to the siloed nature of its sustainability initiatives. By encouraging participation and collaboration through PD, the goal was to encourage cooperation among diverse stakeholders and reduce inherent feelings of competition between departments [24]. Additionally, in order for curriculum change to be effective, it is important that practitioners develop an understanding and sensitivity of the culture of their institution [5]. One way to arrive at this understanding is through conversations with faculty, staff, and students at the university.

Lastly, this particular interview/survey PD method (as opposed to other methods seen in the literature, like pre-selected criteria followed up by focus group conversations) [26] was chosen in order to avoid time and resource barriers, as the iterative process of interviews and recommendations largely took the place of what may otherwise have required a series of conferences to obtain (research posits that "even if representatives are open to such proposals for a change, usually no one can commit the resources" to it) [24]. Indeed, even in a process as flexible as PD, organizational challenges exist; most projects that have used PD have done so through focus groups or forums, which in some cases actually prevented meaningful group participation due to time and availability constraints [16]. To avoid such barriers, this research sought participation through individual interviews (based on interviewee availability) and a follow-up online survey. This is a method of PD that could be particularly useful for large universities with a diversity of stakeholders, all coming from different disciplines with conflicting time commitments. It allowed for the interviewees to significantly contribute to the curriculum conversation, without the responsibility of coordination, compilation, and analysis that may deter them from being a part of the process.

While participatory approaches have received much support in the literature, there is relatively little research on using the participatory process in sustainability implementation at the university level [16]—and even less in terms of curricular development at an institution of such scale and scope. This paper will contribute to the existing PD literature and help understand the benefits and challenges of participation in sustainability implementation, particularly at a large university were time and resource barriers are sizeable.

2.1. Sample Selection

The interviewees in this study were comprised of a purposive sample of faculty, staff, and students who possess high sustainability literacy, have stakes in the sustainability conversation, and have expertise to support their recommendations. Starting with sustainability "enthusiasts" is a concept cited by others in implementing SD into the curriculum as well [4]. Indeed, gathering information from individuals who have kept up with OSU's sustainability efforts resulted in obtaining very rich and relevant information. In conversation with sustainability staff in ESS and OEE, twenty-nine individuals were identified as being sustainability stakeholders who could contribute to this conversation, and of those twenty-nine contacted, twenty responded to outreach and participated in the interview process.

Ten departments/offices were represented in this interview sample (shown in Figure 1): Agricultural, Environmental, and Development Economics (AEDECON); English; Environment and Natural Resources (ENR); the Office of Energy Services and Sustainability (ESS); Food, Agricultural,

and Biological Engineering (FABENG); Humanities; Industrial Systems Engineering (ISE); the Office of Energy and Environment; Student Life; and the University Center for the Advancement of Teaching (UCAT). Of the twenty interviewees, one was a doctoral candidate, two were lecturers, two were associate professors, four were assistant professors, three were full professors, and eight were staff members (serving as departmental directors, program managers, *etc.*).

The snowball method was additionally employed in selecting the interview sample. Because this research was done in a setting where interest, involvement, and collaboration often overlap, this method was particularly useful, as it led to interviews with several individuals not originally on the interview list.

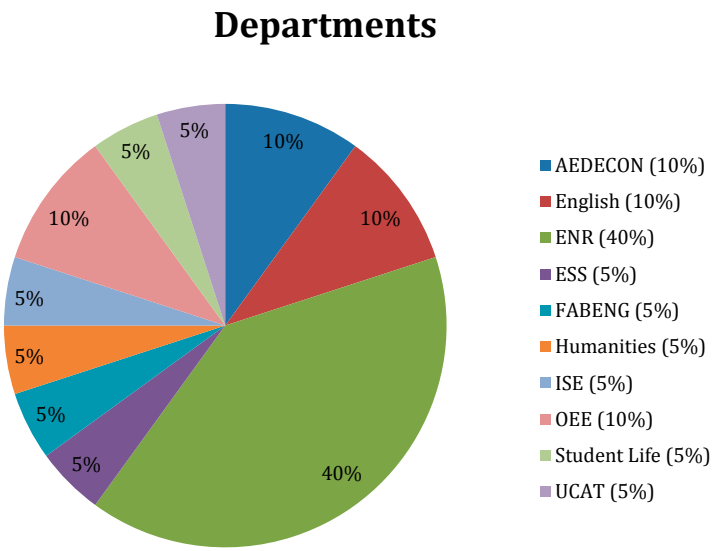

Figure 1. Departments represented in interview sample.

2.2. Interview Process

Data was gathered using semi-structured interviews. While semi-structured interviews follow a specific set of questions, interviewees are allowed to deviate from the initial question and explore other topics they find appropriate. Because sustainability is such a complex concept, additional side conversations were inevitable, and often times were equally insightful. This method allowed for more honest and candid responses, which contributed to thorough content.

Initial contact was made with the interviewees by way of a preliminary e-mail, explaining the research project and requesting the respondents' time for an interview. Interviewees were provided with the list of questions beforehand, in the event that they wanted to prepare for the conversation. At the beginning of each interview, background information was recorded for each participant, including position title/specialization, duration of employment at the university, and years of involvement in sustainability. This information can be used later to identify potential connections between sustainability responses and background variables such as specialization. Interviews ranged from 60 to 90 min. Interviewees were asked the following questions, which were produced by the Office of Energy Services and Sustainability:

(1) What is your personal definition of sustainability?

(2) What do you think are the most important tenets of environmental stewardship, social stewardship, and fiscal stewardship?
(3) What is OSU doing about each?
(4) How can students get involved in each?
(5) What could OSU be doing better in terms of sustainability as a whole, and in terms of each section of stewardship?

The interviewees were then asked to recommend any other sustainability stakeholders at OSU who might provide additional insight. Employing the snowball sampling method was one attempt to make sure multiple perspectives were represented.

The interviewer captured the responses to the questions by typing them on a laptop by hand as the questions were asked, generating a detailed transcript of each interview. Interviews began in June of 2013, and continued on the basis of interviewee availability through December 2013.

2.3. Data Analysis

Interview results ranged from three to seven full pages of text. Because of the nature of the semi-structured interview, responses came largely in conversation; in some cases, this produced straightforward, direct responses to the interview question. In others, specific answers to questions had to be identified within the larger discussion.

The first step in analyzing the responses was to review the content for spelling and transcriber-errors. Next, the interviews were analyzed to identify the text from the interview that specifically answered each individual question—this text was highlighted by bold font. This document was saved as the full-length summary of interview content.

A second document was created for each interview listing the bolded key responses from the full-length summary, thus condensing each interview into its essential core concepts. This document was the only document referred to when recommending content for the curriculum. Both documents were sent back to the interviewee via e-mail, and it was explained that the shorter document was a summary of the interview, which highlighted responses that were likely to be included in the curriculum rating/recommendation process. The original document was provided so that participants could refer back to it if they had any concerns about how the interview was summarized, or how the bullet points were distilled from the full interview. This gave interviewees an opportunity to indicate if the summary had been paraphrased incorrectly, or to flag items they thought should be included in or removed from the summary list. Respondents were also invited to provide additional thoughts upon reflection. This "brain-storming, summarizing, editing, commenting, redrafting, *etc.*" is what lends success to curriculum creation of any kind [24]. Indeed, creating the opportunity for additional dialogue proved to be an essential component in obtaining accurate data; 10 interviewees responded with clarification, edits, or additional thoughts that were then incorporated into their interview summary. Many interviewees also responded with no changes, stating that the summary was a good representation of their thoughts. This process helped to ensure that every interviewee was satisfied with the way their responses were represented. This approach was taken under the assumption that when individuals feel they have a say in what is being created and taught, there is wider acceptance and endorsement for not only the outcome but also the continuation of the curriculum. In a sense, this

participatory research methodology was intended to make the curriculum itself a more sustainable endeavor by gaining the support and engagement of key OSU stakeholders who will likely be involved in promoting and maintaining the curriculum.

Once the interviewee feedback was received, a third document was created that compiled all of the bold concepts from each interview by question (*i.e.*, all summary responses to question 1 were grouped together, all summary responses to question 2 were grouped together by tenet, and so forth). Similar and significantly overlapping responses to each question were then further condensed and grouped, yielding a final set of summarized responses to each question. This finalized list contained all the concepts that were to be considered and ranked by the interviewees to inform the final recommendation of concepts to be included in a curriculum.

The responses for questions 3 and 4 (what is OSU doing about sustainability, and how can students get involved) were easily quantifiable due to the straightforward nature of the questions. However, the responses for questions 1, 2, and 5 displayed a great deal of conceptual diversity and complexity, making them difficult to focus into a concise list of recommendable content. Thus, a rating system in the form of an online survey was employed to better focus the content around the most collectively supported concepts. In developing the wording for the survey, the similar groupings mentioned above were re-summarized with language designed to retain the meaning of the individual responses, and the number of interviewees who mentioned each re-summarized point was tallied and printed after each, so that interviewees had an idea of which concepts were most frequently mentioned. Once the survey material was developed, the survey was created using SurveyMonkey. The participants were asked to rank the responses of interview questions 1, 2, and 5, which were the three most subjective interview questions:

- What is your personal definition of sustainability?
- What do you think are the most important tenets of environmental, social, and fiscal stewardship?
- What could OSU be doing better?

Additionally, an unexpected trend within the interviews demonstrated that the idea of "sustainability as a whole" was important to the interviewees, therefore a question was added to the survey pertaining to that concept as well:

- What do you think are the most important tenets of sustainability as a whole?

For the first part of the survey regarding sustainability definitions, each person was asked to rank the responses in order of importance (with one being the highest) according to their own belief, as well as how they felt it could best be communicated to students. Anticipating the possibility that there could be a difference between what the interviewees valued themselves and what they thought should be emphasized in an introductory, online curriculum, respondents were asked to rank both. Additionally, in order to acknowledge that sustainability is not cut and dry (and perhaps interviewees would have no absolutes), participants were also asked to include a threshold of definitions that they saw as imperative to be included in the curriculum in some way. This allowed for them to rank definitions but still indicate if they valued multiple definitions for use in the sustainability curriculum.

For the second part of the survey, interviewees were asked to indicate the most important tenets of environmental, social, and fiscal stewardship, which were separated by respective category. Next, they were asked to indicate the most important tenets of sustainability as a whole.

Finally, interviewees were asked to indicate which responses for "what OSU could be doing better" were most important.

For the first question only, the rankings were established by calculating a weighted distribution average of each sustainability definition, in which low numbers were representative of high importance, and vice versa. Essentially, this measured the number of times each definition was ranked 1–9, and then averaged that number and converted it into a percentage. The remaining questions did not require ranking, so results were determined based on how frequently each item was chosen.

Having interviewees evaluate each response was helpful in getting a more focused and consensus-driven foundation for content recommendation. This also provided a more quantitative means of assessing the data. Once all responses were in, the content that accrued the highest ratings was recommended for inclusion in a curriculum. The survey was open for three weeks, and generated a response rate of 61%.

3. Results and Discussion

3.1. Results

The results of the survey have been graphed and are shown below. Underneath each graph is a concise description of the graph's findings. Figure 2 shows the graph of the nine definitions ranked in the survey, with the actual definitions listed below in order of popularity. Figures 3–7 show graphs of the most popular tenets identified by the interviewees themselves, followed by the number of times each tenet was selected as one of the "most important" in the survey. The most commonly chosen tenets are listed immediately underneath the graphs.

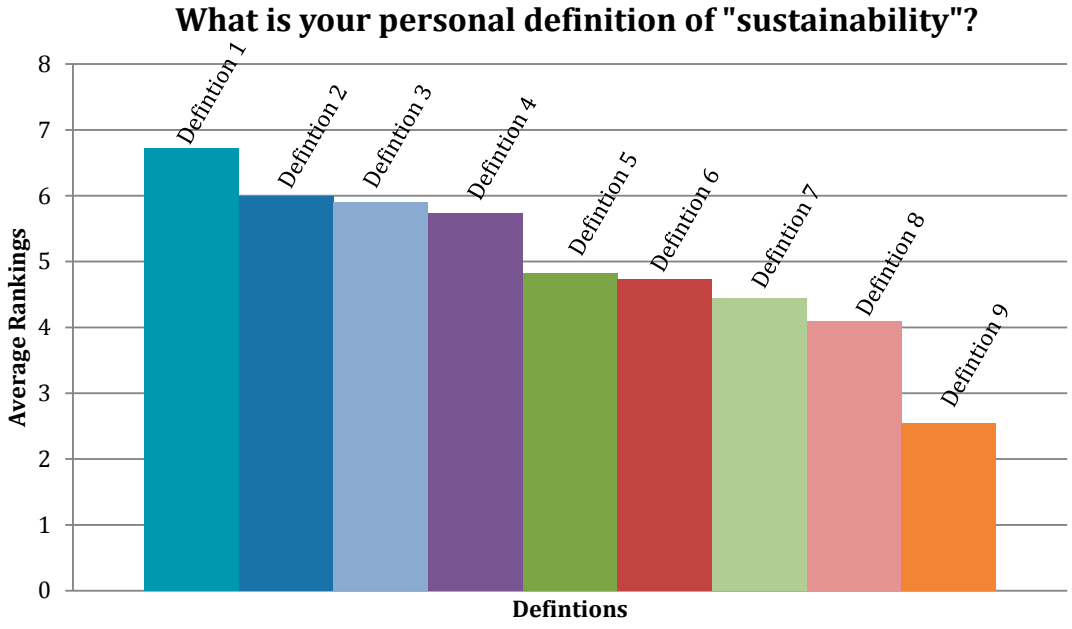

Figure 2. Definitions of sustainability.

Definition 1: Sustainability is a condition that allows humans and other species to flourish and thrive in perpetuity within the carrying capacity of the earth and in which individuals are not burdened unjustly by the actions of others.

Definition 2: Brundtland Commission Report's definition, which implies meeting the needs of the present without compromising the ability of future generations to meet their own needs. However, there was also mention of that definition needing more.

Definition 3: To Keep in Mind the Triple Bottom Line, or variations thereof (Sustainability can be separated into three areas: the environmental, social, and economic components. There should be a recognition that you need all three components, and the nexus of those is where you are sustainable and can meet the needs of each system over the long term).

Definition 4: Continued Existence (Sustainability is about identifying social, technical, economic, and political systems and structures that guide humanity in a way that will ensure our long term survival. Whatever we do, we have to make sure that we exist tomorrow, because ultimately, you can't do anything sustainable unless you're here.)

Definition 5: To Maintain (Sustainability is using the mix of resources that are available at that time to maintain the ecosystems, economy, and society at certain level, and to maintain our standard of living.)

Definition 6: To Be Conscious and Caring (Sustainability is about caring about neighbors, the environment, and future generations. It is about improving the quality of life for everybody).

Definition 7: To Balance (Sustainability is about the balance of different forces. We have to identify why and how we are out of balance in order to determine how to get things in balance for sustainability).

Definition 8: Contrasting Strong *vs.* Weak sustainability, where weak sustainability is simply not depleting our resources, and strong sustainability is not only not depleting resources, but improving our stock of resources as well.

Definition 9: To Preserve (I think of sustainability in terms of how we can preserve the biodiversity on earth now and still encourage the organisms that are living on it—whether that may be humans, insects, fish, *etc.*).

As demonstrated by the graph above, definition 1 ("Sustainability is a condition that allows humans and other species to flourish and thrive in perpetuity within the carrying capacity of the earth and in which individuals are not burdened unjustly by the actions of others") was ranked highest, on average, by the participants, with a score of 7.2. Respondents were also asked to include a minimum threshold of definitions to be included in the curriculum. There was an average minimum threshold of approximately five definitions.

Figure 3 (below) shows the most important tenets of environmental stewardship, ranked by participants from lowest (transportation) to highest (ecology).

Ecology, Biodiversity, Energy, Overconsumption, System Interconnections, Climate Change, Resource Management, Water, and Life Cycles were the most commonly selected environmental stewardship tenets.

Figure 4 (below) shows the most important tenets of social stewardship ranked by participants from lowest (problematizing issues correctly, development) to highest (justice/equity).

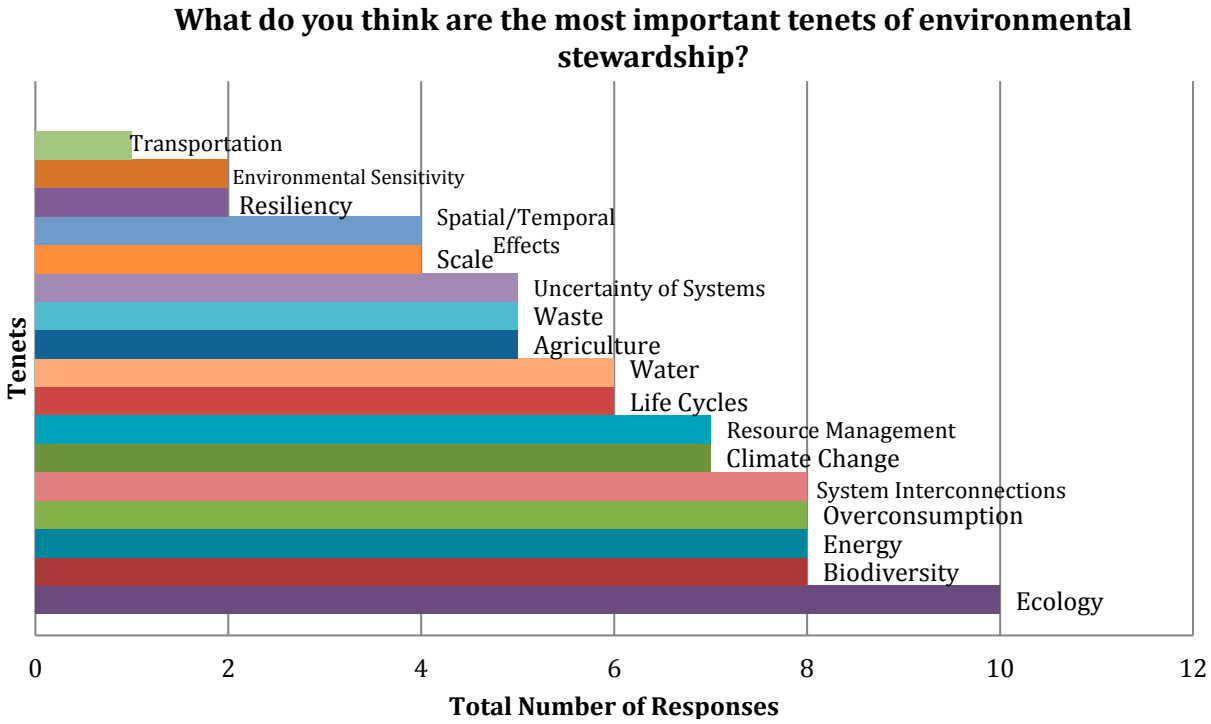

Figure 3. Important tenets of environmental stewardship.

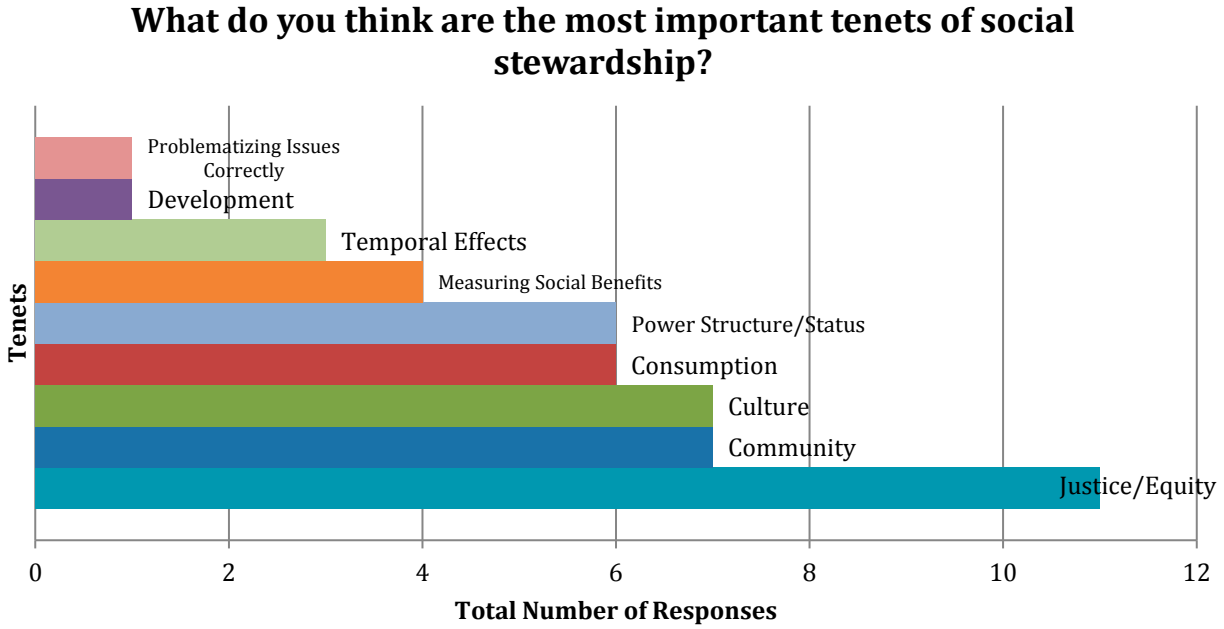

Figure 4. Important tenets of social stewardship.

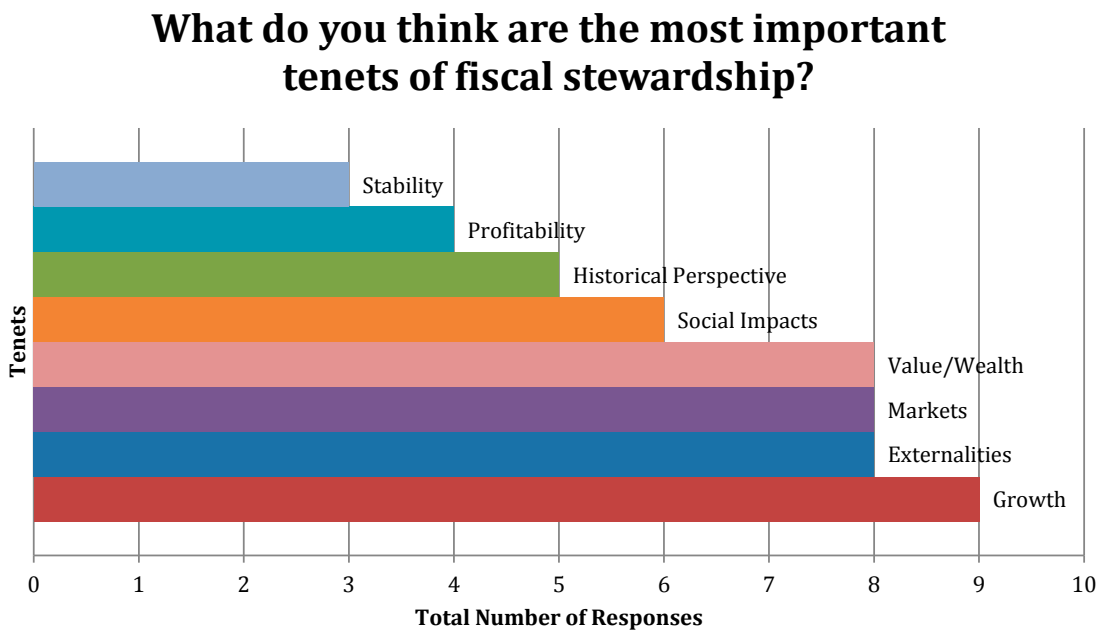

Figure 5. Important tenets of fiscal stewardship.

Justice/Equity, Community, Culture, Consumption, and Power Structure/Status were the most commonly selected social stewardship tenets.

Figure 5 (above) shows the most important tenets of fiscal stewardship ranked by participants from lowest (stability) to highest (growth).

Growth, Externalities, Markets, Value/Wealth, and Social Impacts were the most commonly selected fiscal stewardship tenets.

Figure 6 (below) shows the most important tenets of sustainability as a whole, ranked by participants from lowest (tradeoffs, preventative culture, education) to highest (critical thinking/bigger picture).

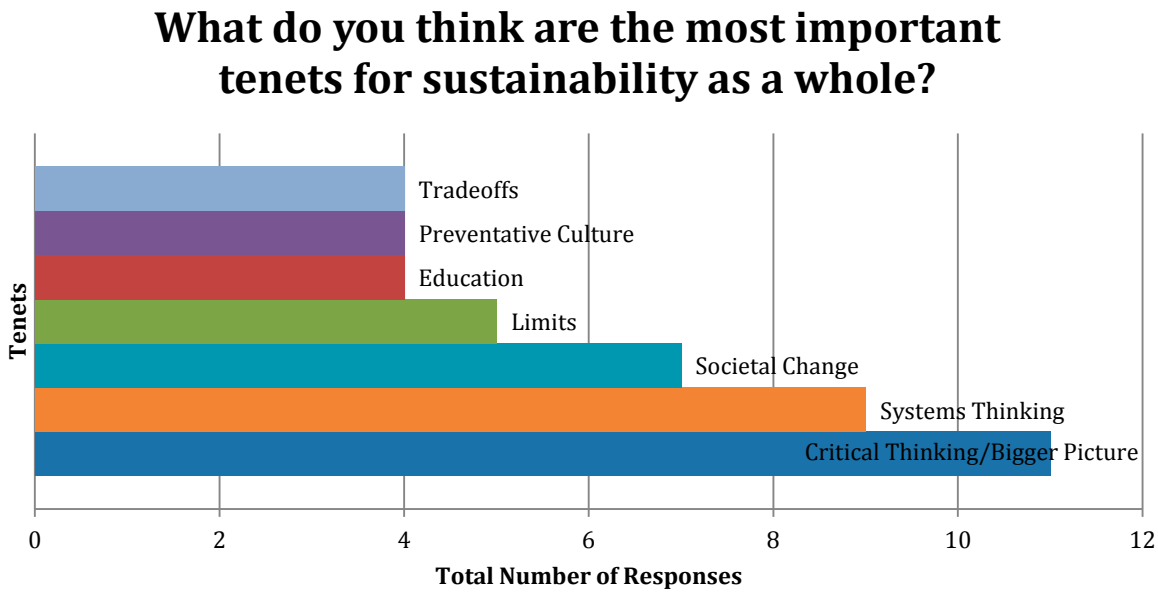

Figure 6. Important tenets for sustainability as a whole.

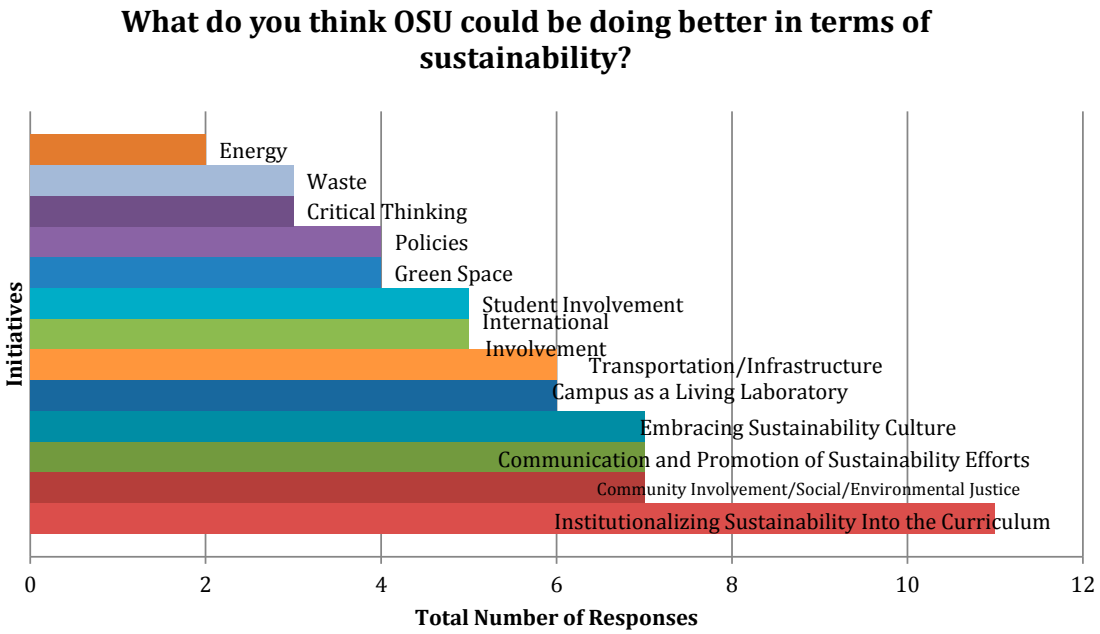

Figure 7. Recommendations for what OSU could be doing better.

Critical Thinking/Bigger Picture, Systems Thinking, and Societal Change were the most commonly selected recommendations for sustainability as a whole.

Figure 7 (above) shows what OSU could be doing better, ranked by participants from lowest (energy) to highest (institutionalizing sustainability into the curriculum).

Institutionalizing Sustainability into the Curriculum was by far the most commonly selected area for improvement.

Based on the recommendations of many of Ohio State's key sustainability stakeholders, concepts deemed as essential for inclusion in the creation of a sustainability curriculum are summarized below. The complete survey and survey results can be found in the Supplementary file, along with other interview and research materials. Information not listed in the Supplementary file can be obtained by contacting the author if interested.

The curriculum should focus on the following tenets of environmental stewardship:

- Ecology (Ecosystem Services, Ecological Bottom Line, Cycles, *etc.*)
- Biodiversity (Biodiversity (Trophic Levels, Species Interactions, *etc.*)
- Energy (Energy (Production, Extraction, Use, Alternatives, *etc.*)
- Overconsumption (Consumer Culture, Buying Local, Planned Obsolescence, *etc.*)
- System Interconnections
- Climate Change
- Resource Management (Sustainably Managing Resources, Tragedy of Commons, *etc.*)
- Water (Access, Cost, Runoff, Pollution, *etc.*)
- Life Cycles (Where Products Come From/End Up).

The curriculum should focus on the following tenets of social stewardship:

- Justice/Equity (Environmental Justice, Social Justice, local and international examples, *etc.*)
- Community (Importance of Community/Building Strong Communities)

- Culture (Different Cultures Perceive Sustainability Differently)
- Consumption (How Our Consumption Affects Others)
- Power Structure/Status (Political Economy, Fundamental Cause Theory, *etc.*).

The curriculum should focus on the following tenets of fiscal stewardship:

- Growth (Reevaluating Growth and Progress)
- Externalities (Prices Reflecting Total Cost, Properly Valuing Resources, Price Signals, Internalizing Externalities, *etc.*)
- Markets (Markets and Consumer Incentives, Redistributive Mechanisms, Subsidies, Cap and Trade, Rebound and Substitution Effects)
- Value/Wealth (Redefining Wealth, Valuing Social and Environmental Factors Equally)
- Social Impacts (Capturing Social Welfare in the Market, Effect of Externalities on Social).

The curriculum should focus on the following tenets of sustainability as a whole:

- Systems Thinking (Students Need to Think of the System as a Whole, Everything is Connected)
- Critical Thinking/Bigger Picture (Critically Assessing Claims, Looking at the Bigger Picture, Paying Attention to the Impact of Your Actions, Recognizing Challenges of Sustainability—It Is Not All Black and White)
- Societal Change.

The curriculum should highlight the following sustainability initiatives at OSU:

- Educating Future Global Citizens (EEDS major, SENR courses, FLC)
- Energy (25% of OSU's Electricity Generated by Wind, Energy Efficiency Building Standards)
- Waste (Zero Waste Initiative, Composting and Recycling Programs)
- Community Involvement (Weinland Park, Community Gardens)
- President's Climate Commitment
- Research (Around 400 Faculty Researchers in Energy, Environment, or Sustainability)
- Student Support (Encouraging Student Leadership in Sustainability ex: CocaCola Grants).

The curriculum should highlight the following areas for student involvement:

- Student Organizations
- Chosen Area of Study (EEDS, Sustainability Courses, Incorporating Concepts in Any Discipline)
- Research (In Energy, Environment, or Sustainability, CocaCola Sustainability Grants)
- Lifestyle Changes (ex: Altering Consumption Patterns)
- Volunteer Opportunities (Zero Waste, BuckiServe, *etc.*).

Areas in which OSU could improve:

- Institutionalizing Sustainability Into the Curriculum (We should integrate sustainability into teaching university-wide, so that sustainability is a component of courses taught in all different majors. A General Education course or a multidisciplinary seminar related to sustainability would be helpful)

- Communication and Promotion of Sustainability Efforts (OSU could do a better job at promoting its many programs and initiatives and then demonstrating in a clear way their connection to a larger sustainability commitment)
- Community Involvement/Social/Environmental Justice (The concept of environmental justice and integrating sustainability into surrounding areas could be improved; we could do a better job at focusing on who is outside the borders of the university, by getting more deeply involved with community work and enhancing our social fabric)
- Embracing Sustainability Culture (Instead of just meeting the bar, we need to exceed it; OSU could be a leader in developing the next set of standards for sustainability. We have signed on verbally to the sustainability discourse, we just need to get to the point where sustainability is our culture).

3.2. Discussion

The Participatory Development process used in this research has provided a clearer sense of what OSU sustainability stakeholders find to be important concepts and tenets of sustainability for an introductory sustainability curriculum at OSU. Like all complex topics, however, initial questions often lead to additional questions (many of which are beyond the scope of this study, but are discussed further in the Implications for Future Research Section). During the interviews, responses were more often in the form of a conversation than a clear-cut answer—which simply reinforces the connotation of complexity and ambiguity often associated with "sustainability". Due to many factors, including the semi-structured interview method, interviewee's interest and investment in the topic, and sustainability's multifaceted meaning, the majority of responses were peppered with qualifications, explanations, and at times with skepticism. Thus, while the results described above achieve the goal of providing a helpful starting point to develop a sustainability curriculum, there are several remaining questions as well as some emergent questions that merit additional exploration. Much of this is not reflected in the above recommended concepts, but there is valuable insight to be gained by examining the further comments and questions in the interviews which may provide a deeper lens with which to view sustainability. Common feedback for each question is discussed below. Participants have been kept anonymous by random assignment of letters A-T, and quotations from participants are used to illustrate the discussions.

(1) What is your personal definition of sustainability?

> *"Sustainability has multiple cultures and approaches and dimensions, there's not one exact path or one way to look at it."—Participant "M"*

Very few respondents had a ready definition of sustainability that they were completely satisfied with. Some were dissatisfied with the term itself, characterizing it as a buzzword that is "sort of meaningless," vague, abstract, uninspiring, and even polarizing. Others had no definition at all, while others had multiple. The consensus among all respondents was that sustainability is a complex word that is not easily broken down or defined. As one interviewee stated, sustainability is even defined differently among members of the same discipline. Consequently, developing one definition that is supported by disciplines across the university is a difficult task. This raises the question of whether it is

beneficial to define it at all; and feedback from the survey varies here. While there was one definition that scored highest, on average, among the participants, many were hesitant to commit to just that one definition. In fact, nine of the eleven respondents indicated multiple definitions being of importance, with an average "minimum threshold" of five (the range of minimum definitions varied, from one interviewee setting the threshold at one, to two interviewees setting the threshold to include all nine definitions). The fact that only one participant was satisfied with providing a single definition in the curriculum, argues for an alternative approach to simply using the highest rated definition. Perhaps there is a need for an expanded definition of sustainability, in which several definitions are listed, or concepts of several are combined into a string of related statements.

In exploring the possibilities for including multiple definitions in the curriculum, a graph of the ranked definitions can be compared with a graph of the definitions that appear in minimum threshold lists (see Figures 8 and 9 below). We see that in addition to definition 1, definitions 2, 3, and 4 are clearly priorities in terms of both ranking and threshold for inclusion in the curriculum:

This analysis beyond simply the top ranked definition alludes to the possibility that perhaps narrowing in on a single definition of sustainability is not as beneficial for our understanding as considering and debating its multiple meanings. However, one interviewee did caution the practice of endorsing multiple definitions at Ohio State, suggesting that while sustainability is defined in a variety of similar ways, OSU should be united in the way it is defined here. It is true that a common complaint among interviewees is that OSU is a "multi-headed monster" when it comes to sustainability. Perhaps having too many definitions would only contribute to this chaos, by overwhelming students and diluting the sustainability mission at OSU. It could be that the optimal solution is somewhere in between, as suggested by one interviewee: "*I wouldn't suggest deluging students with definitions, and I would not prescribe the "correct" one; rather expose them to various definitions for them to arrive at what is their personal definition."—Participant "B"*.

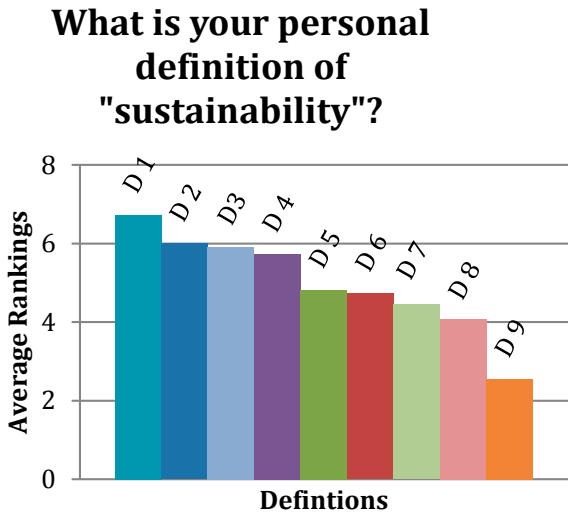

Figure 8. Definitions of sustainability.

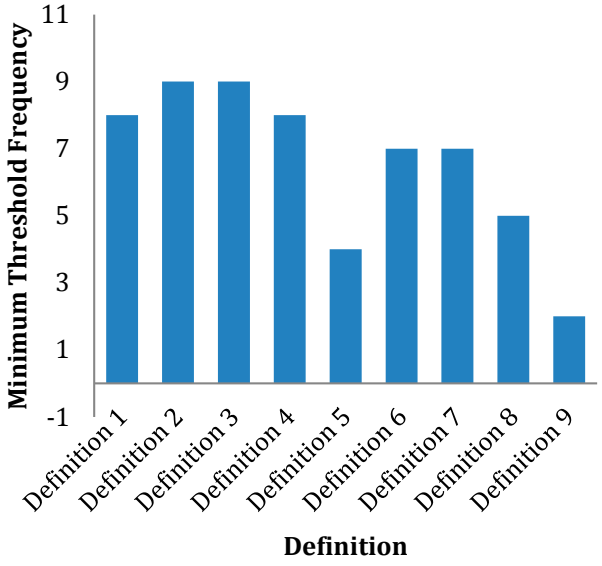

Figure 9. Minimum Threshold Frequency for Sustainability Definitions.

Given this feedback, this research recommends one comprehensive definition that combines the top four ranked definitions (beyond the top four definitions, there is a discrepancy between the next highest ranked definition (definition 5) and the next most frequently mentioned within the thresholds (definitions 6 and 7)—so recommending any definitions beyond these four cannot be done with equal confidence). A single expanded definition such as this acknowledges the need for OSU to identify with one local definition, while still including essential concepts from other favored definitions. Because we seek to make the most thorough recommendations possible for definitions to be considered in the sustainability curriculum, definition 1 is listed primarily; however, concepts from definitions 2, 3, and 4 are also included as a part of the extended definition: "Sustainability is a condition that allows humans and other species to flourish and thrive in perpetuity within the carrying capacity of the earth, and in which individuals are not burdened unjustly by the actions of others. To achieve this sustainable condition, we must act in a way that perennially guards against significant risks to survival, which in part means finding a balance between the environmental, social, and economic components of a system. This balance is necessary if we are to flourish and thrive in the present without compromising the ability of future generations to do the same".

One objective of this research was to obtain a definition of sustainability that OSU could adhere to, as well as operationalize in reporting sustainability programs in annual scoring by AASHE STARS. However, as demonstrated through this discussion, how OSU will (or should) define sustainability is clearly a topic still up for debate, and invites a continued conversation. The above recommended definition could serve as an impetus for a more broadly discussed decision on how to define sustainability at OSU.

(2) What do you think the most important tenets of environmental stewardship, social stewardship, and fiscal stewardship are?

> *"They're all integrally related, and to me, that's the basic tenet of sustainability. It goes against the basic fundamental tenet of sustainability to separate the three because they're interdependent."—Participant "J"*

Nearly every interviewee responded to this question with the assertion that the three categories cannot (and should not) be separated. Instead of describing their importance separately, the focus seemed to be on how they function together. Therefore, a strong recommendation made by many interviewees was to provide a "systems integration" section within the curriculum, emphasizing the interconnections that exist within these three realms of sustainability. An example of this could be with the concept of food:

Environmental	**Social**	**Economic**
Production	Unequal access	Government subsidies
Stresses on land	Food deserts	Externalities

It is difficult to consider the environmental implications of large-scale food production (which often include soil erosion and decreased productivity of the land) without considering the economic structure that encourages it (government subsidize large scale farms, making food seem cheaper than it really is, leading to more production and further environmental degradation). It is difficult to consider either of those without considering the social impact. Mass-produced food (which is often environmentally degrading) is cheaper (because of government subsidies and poor quality) so lower quality food becomes the only option for lower socioeconomic status individuals. They purchase cheap food because they are in a food desert, and the cycle continues.

Indeed, the interrelated nature of these three elements was so apparent that it was difficult to categorize the tenets appropriately. For example, one interviewee mentioned the concept of water as an environmental tenet, however, water access was mentioned by another interviewee as a social issue as well. This was not an isolated case; often the same concept was mentioned in the discussions of environmental, social, and fiscal stewardship. Another example of such concepts was energy (environmental and socioeconomic effects of production, externalities). One interviewee expanded on this topic saying, *"you have to step back and look at the system. If we stop burning coal, then the price of electrical energy would quadruple and then we would impinge on the social aspect of sustainability when we bankrupt people. We can't look at these factors in isolation. We have to look at them all as a system."—Participant "E"*. Thus the interaction between environmental, social, and fiscal elements of sustainability proved to be unavoidable even just on paper.

Feedback for this section also included suggesting alternatives to the triple bottom line, one being the "nested rings" approach (The Natural Step), where instead of representing sustainability with the standard triple bottom line, it is instead demonstrated by three nested rings, where society is within the environment and economy is within society. It was suggested that this way of modeling neutralizes the business stigma that is often associated with sustainability today. "Scale, equity, and efficiency" was another alternative suggested to the triple bottom line. There was additional feedback regarding the labeling of the sections: "economic" was preferred over "fiscal," and several interviewees discouraged the use of "stewardship" in the social context, because it has a connotation of managing social systems, which can be problematic and unwise. Comments such as these emphasize the complex nature of sustainability questions, and suggest that a range of philosophical and ethical preferences exist within the sustainability discourse. These comments reveal a dimension of depth that is valuable to a thoughtful sustainability discussion.

(3) What is OSU doing about each?

> *"If I were going to talk about our sustainability efforts, I'd say there needs to be more of a critical approach."—Participant "P"*
> *"I think we are probably more rhetorically active than actually active. But we are improving and could certainly improve much more."—Participant "T"*

As the survey results indicate, the majority of interviewees were largely content with what OSU is doing in terms of sustainability, particularly for its size, and acknowledged that the university is moving in the right direction. However, a handful of interviewees did question the authenticity of Ohio State's commitment to sustainability, suggesting that some initiatives are geared more towards being "feel good" projects or saving money, and less towards addressing critical sustainability issues. There was no question among all interviewees that OSU is doing a great deal in terms of sustainability, but there was the suggestion that some of OSU's priorities are misplaced, and more resources are spent on the "window dressing" than on acting (for example, one interviewee described a biking experience on campus: *"I look over and there's a massive banner about green sustainable construction. I'm the only bike sitting there with no bike lane, and I ride up to the [building] and the bike rack is gone. I feel like our priorities are not necessarily in the right place when it comes to sustainability. We talk about being sustainable but we don't create the means for it to actually work"—Participant "L"*). Despite OSU's progress in sustainability, to some interviewees there still seem to be inconsistencies in regard to the university's public support and endorsement for sustainability and the meaningful action being taken.

In terms of naming examples of OSU's involvement, not one person drew a blank when listing off environmental initiatives. However, there was notably lower awareness regarding OSU's involvement in social stewardship, and even less regarding fiscal stewardship. This indicates that project promotion and awareness is an area where Ohio State has the opportunity to improve, not only among students, but among sustainability leaders as well. It could be that some of the actions described as "window dressing" above reflect an attempt to better communicate what OSU is doing in these areas—which appears to be necessary to some degree.

(4) How can students get involved in each?

> *"It's important for students to realize that whatever they're passionate about, there's someone here that will support that."—Participant "O"*
> *"Be curious. Ask questions. Do something. And share it with somebody else."—Participant "C"*

There was an overwhelming consensus among interviewees that there is little shortage of opportunities for students to get involved—students simply have to find what they're interested in. Beyond this, there were three main types of involvement that were referenced. The first type of involvement was through established sustainability avenues, such as student organizations, coursework, and on-campus initiatives related to sustainability. These involvement opportunities were repeatedly cited by interviewees. The second type of involvement referenced similar opportunities (student organizations, coursework, *etc.*), but put emphasis on the fact that they did not have to be associated with sustainability for students to make sustainable impacts within them—"*Regardless of what they're doing, they can challenge themselves about how to integrate sustainability principles into*

whatever they're passionate about."—*Participant "J"*. An example of this might be students challenging professors to demonstrate the sustainability of whatever it is they're teaching. The third type of involvement acknowledged the notion of sustainability in an even less bounded sense; several interviewees said students could act sustainably just by paying attention to the impact of their actions; by being critical thinkers; by asking questions about where our products come from; by caring about neighbors. For many interviewees, getting involved in sustainability is as simple as engaging in meaningful conversations with those around you. For these sustainability leaders, sustainability is a lifestyle, a way of thinking, and an avenue for being conscious and informed citizens.

(5) What could OSU be doing better, in terms of sustainability as a whole, and in terms of each section of stewardship?

Overall, there was positive feedback regarding OSU's sustainability initiatives. However, most interviewees did acknowledge that there is capacity for more; whether that be integrating sustainability into the curriculum (100% of interviewees supported this), or enhancing its role in the culture of Ohio State. While the list of suggestions for improvement may seem daunting, that does not necessarily reflect poorly on Ohio State's sustainability performance. It should be noted that no interviewee responded to this question with a simple charge to "recycle more". Ohio State is already doing a great job of that, and as has been outlined in this paper, has made great strides in other areas related to sustainability as well. The university has already made improvements in recycling, waste, physical operations, energy, *etc*. Because of that, the remaining options for improvement get harder and more complex. This is a good problem to have. Ohio State is an institution with the resources, the momentum, and the minds to make incredible handprints. This feedback is an acknowledgement of that—a call to raise the bar yet again, and continue making worthwhile improvements towards a sustainable future.

(6) Sustainability as a Whole

One question that was largely overlooked in this research pertains to recommendations for sustainability as a whole. Interviewees were asked to consider the three "pillars" of sustainability in isolation and make recommendations for what students should know about each. However, they were not asked to provide insight on what students should know about the larger concept of sustainability itself. Most interviewees answered this question throughout conversation and through their responses to other questions. As a result, several reoccurring concepts were mentioned throughout the interviews that spoke to sustainability in a larger sense, as general recommendations for the promotion of a sustainable culture. This trend within the data was recognized and a question was created in the survey to ask about the most important tenets of sustainability as a whole. The two that were the most commonly chosen on the survey (and seemed to be most frequently woven within the interviews) were critical thinking and systems thinking. Quotations are used to demonstrate the importance interviewees placed on each.

Critical thinking

> *"The sustainability issue can easily become a value-laden topic, so the university's role should be based on critical thinking and evaluation."—Participant "K"*
> *"People need to think more critically about what sustainability means."—Participant "S"*

"I don't really have a strong feeling about the content in those sections, it's more about the problem solving process."—Participant "J"
"There are so many myths surrounding sustainability, so critical thinking is key. Students need to analyze—don't jump on or off the bandwagon. Be a skeptic."—Participant "E"

Systems thinking

"Students need to think of the system as a whole."—Participant "R"
"We will have a suboptimal solution if we break the idea of sustainability down into subcomponents."-Participant "F"
"The biggest thing students should be aware of is systems thinking, which means that everything is connected to everything else, so changing anything has consequences farther than what you may have predicted."—Participant "L"

The feedback on systems thinking in particular echoes the feedback given in the tenets section, which was the idea that the three pillars of sustainability being considered in this study cannot be viewed in isolation. It is clear that there are larger systems at play that must always be taken into consideration when thinking about sustainability.

The emphasis on critical thinking and systems thinking seems to speak to the "bigger picture" of sustainability. As the data suggests, interviewees placed value on teaching students about concepts like energy and resource management, however, that does not equate to giving students the false impression that they must think in absolute terms: all green energy is good and all logging is bad. On the contrary, interviewees were clear that students should be able to make critical, unbiased assessments. This means understanding that some green biofuels take more energy to make than it takes to get oil, so it could be a loss to the environment, as one interviewee pointed out. It also means understanding that stopping logging might help the spotted owl but it might also result in economic and social destruction—meaning it may not be that sustainable, as pointed out by another interviewee. Across the board, there was a clear consensus that because sustainability is so multi-dimensional, it is essential that it be evaluated in a critical and holistic way. As one interviewee stated, *"we don't want to brainwash students into doing good actions. We want them to come away with critical thinking, and that may lead them to good actions, but the important part is the thinking that got them there."—Participant "K"*.

3.2.1. Limitations

As might be expected, interviewee's responses tended to reflect their specialization or focus area within the university. The sample was intentional, developed in consultation with ESS and Office of Energy and Environment (OEE) sustainability staff who recommended key sustainability faculty and staff from a range of departments across the university including those who have been most involved in university sustainability efforts; however, this was limiting in that the resulting data did not come from a representative sample of campus expertise in its entirety. Faculty and staff from other units associated with sustainability, such as City and Regional Planning or Geography, were not interviewed, and as a result our findings may not include the wider perspective that might be gained from these units.

Similarly, the findings may have been limited by the scope of the question set produced by ESS. Because the interviewees were expected to respond to the provided interview questions, the responses were somewhat pre-conditioned and narrowed as a result. This was a limitation in that there may have been important pieces of the conversation left out. This limitation was in part overcome, however, by employing the semi-structured interview method, in which a larger conversation often provided answers to questions that weren't initially asked (for example, interviewees provided responses to the unasked question "what do you think are the most important tenets for sustainability as a whole?"—as illustrated in the Discussion section above).

While the semi-structured interview method was effective in opening up the conversation and attempting to reduce pre-conditioned or narrowed responses, this also added a level of complexity to the data analysis, particularly in quantifying and categorizing the data. Because a semi-structured interview allows for open-ended questions, this meant an answer to a question was often touched on in the previous or the following question's discussion. For example, in one interviewee's response to Question 1 (what is your personal definition of sustainability?), the concepts of preserving biodiversity, species competition, perpetual economic growth, the importance of environmental education, and the impact of our political system on sustainability were all discussed. Not only was it difficult to identify a single definition in that discussion which adequately represented what the interviewee was communicating, but the response answered more than just the first question: it also listed common sustainability tenets, which are asked for in Question 2. Because they were already discussed, these tenets were less likely to come up again in Question 2 (what do you think are the most important tenets of environmental, social, and fiscal stewardship?), and as a result may not have been included in the "tenets" recommendations. Difficulty in categorization existed not only across questions, but also across tenets (water was mentioned as an environmental issue and a social issue) and even within tenets (within social stewardship, the concept of actions affecting others downstream was mentioned both in the context of social justice and in the context of community). With the same concept being mentioned in several different contexts, recommending content for a curriculum that was not redundant but was thorough was a difficult task. Had this been a more structured interview with predetermined answer choices, or more emphasis on concise and direct answers, these issues may have been less likely. At the same time, questions that were more constraining or that forced only certain answers would lose the complexity that seems important to the topic of sustainability. Ideally, having interviewees participate in the editing and revising process helped to ensure proper categorization, but nonetheless, turning conversations into quantifiable and teachable points was challenging.

Quantitative measurements as a whole were limited in this study in that their primary function was to provide descriptive measures of the qualitative data gathered. For example, the quantitative measurement methods used, such as ranking, are purely based on the opinion and judgments of the intentionally selected sample of interviewees. Measurements are similarly limited in that the sample size participating in the research is small (and even smaller for those that participated in the survey), so drawing absolute conclusions or pursuing further statistical analysis to examine the data would not be appropriate. Further research might employ more quantitative analysis of this study's emerging concepts.

Lastly, a limitation frequently mentioned by respondents is that sustainability is not clean-cut; it is a concept with many different definitions, meanings, and associations. This makes it hard to quantify, and hard to provide a summary that will resonate across the campus and across the curriculum. As

Fiksel *et al.* note, the concept of sustainability is "esoteric, multidimensional, and subject to many different interpretations. Consequently, it is a great challenge to design effective communication materials for multiple audiences inside and outside the university" [18]. This has been evident in this research project; sustainability means different things to everyone, so it is difficult to identify which responses are most valid.

3.2.2. Potential for Future Research

> *"A sustainability problem for you to think about is the social sustainability of this project. Finding someone to take ownership of it and keep it going is important."—Participant "I"*

As mentioned throughout this paper, the goal for this research is to better understand key definitions, concepts, and priorities of sustainability as they pertain to OSU, in order to eventually inform content for a curriculum and provide (through that curriculum and through the research process itself) a stepping stone for further projects. Consequently, there are several avenues of potential future research that extend beyond the scope of this particular research project—particularly in design, implementation, and evaluation.

Perhaps the most immediate research to be done would be to further develop the framework outlined above beyond its basic subject matter. This is true particularly for the list of sustainability tenets, which describes only concepts, often times without providing examples or going into detail. Now that there is a consensus of what is important to focus on, the next phase will entail coming up with explanatory scenarios and descriptions of these concepts to illustrate their importance in environmental, social, and fiscal arenas. This may require a focus group (a common method in other SD curricula research) [26] to confirm, edit, or reevaluate the suggestions made in this research, and add any additional thoughts to the conversation. At the very least, the continuation of this project will provide further opportunity for interviewees and other interested parties to engage and shape the ideas being presented in this research. It will largely be up to this group of curriculum developers to decide the extent to which the recommendations and ratings made here will determine the curriculum content. After all, this study is not designed to determine absolute cut-off points for which concepts "should" be included, it simply provides an informed ranking of what a purposive sample of OSU sustainability stakeholders and educators think are the most important ones to include in the curriculum; the decisions about which to include and which to leave out will be left to the committee that creates the curriculum. Regardless of who takes on the task of continuing with this curriculum, however, there is immediate work to be done in elaborating on the core concepts identified.

In addition to expanding upon the content, another necessary phase of research would address the design and delivery of the material. During the interviews, many respondents questioned the idea that the curriculum be voluntary, suggesting it may draw less participation than a required curriculum—or only draw participation among certain groups (as was seen among the participants of the sustainability knowledge assessment, where SENR had the highest response rate) [20]. There are several characteristics that make an online, voluntary curriculum such as the one proposed by ESS an appropriate avenue for sustainability integration, the most compelling one being its flexibility. The barriers to large-scale curriculum change discussed previously (size, funding, institutional traditions) are less prevalent with a voluntary and not-for-credit sustainability curriculum; this kind of curriculum

requires little administrative approval, significantly less demand for structural change, and the political, economic, and logistical tensions that could arise from a voluntary online course are minimal. A voluntary course could be a way to get the ball rolling and provide students with a solid foundation of sustainability concepts with less of the associated "red tape". However, further research as to whether or not this route would be more beneficial than an alternative (such as a General Education course, or sustainability education through experiential learning) is necessary. There is a good deal of literature available discussing the methods of design and implementation that should be consulted [13].

Another potential avenue for future research would be in expanding the participant list. As discussed in the limitations section, the sample size was not representative of OSU as a whole, which may have limited the data in this study. In order to get a more holistic set of responses, the next step would be to expand the participant list and include departments outside of the selected fields of ENR, AEDECON, FABE, *etc.* A statement made by an interviewee from the Office of Energy and Environment seems to support this latter avenue: *"We think that the issues of energy, environment, and sustainability are broad enough and large enough that we're going to need lots of people from many different backgrounds to work with one another to begin to solve the problems. So we don't want to exclude people who can potentially bring real and viable solutions."—Participant "C".* Similarly, sustainability literature suggests that integrated or inter-disciplinary approaches to sustainability are critical, reinforcing the idea that efforts to make further connections and bring a wider range of perspectives are desirable.

Furthermore, future research could closely examine the perspectives of the "average" student or faculty member on campus. Consulting the key sustainability stakeholders was a helpful starting point in this conversation; however, expanding the conversation beyond the "usual suspects" will give us a better idea of what the university as a whole thinks. A wider transect of knowledge will help identify the gap, if any, that exists between what sustainability experts know and what a population that better represents the university knows. This research has already helped spark that process: in the summer of 2013, researchers on this project along with leaders in OEE informally explored student perspectives on sustainability. Twelve students were interviewed on the Oval (a grassy area located at the heart of Ohio State's campus) and asked the same questions as were asked in this research study (video available at: available at: http://oee.osu.edu) [27]. The responses of the "everyday" student were much different from the sample of sustainability stakeholder responses, confirming suspicions that there may be varying degrees of sustainability knowledge around campus. Further researching university-wide sustainability knowledge will help OSU identify where education can be improved, to better serve the community as a whole.

Lastly, a very important piece of further research would examine how these results could inform future projects at Ohio State beyond just the curriculum proposed by ESS. Ohio State has many options for integrating sustainability in the curriculum. Feedback from interviewees regarding the questions asked and content included may suggest that this information applies to other projects; several did not like the common sustainability concept of the three-legged stool, as mentioned in the discussion. One interviewee did not like the idea of providing definitions at all, stating that unless students can put these concepts into practice, they're just memorizing definitions—which does not contribute to the likelihood that they will graduate as global citizens. Certainly as content for this curriculum is developed, the participant list is expanded, and effectiveness is tested through ASK surveys, there will

be the opportunity to discuss and move forward with additional projects that gear this content towards models that better suit the interviewees' recommendations, or OSU's goals as a university.

4. Conclusions

> *"Sustainability education should reach every student if the university is to contribute to an informed and effective citizenry"—Sustainability Planning at OSU*

Ohio State brings a unique perspective to the sustainability literature: as a large, Midwestern university that is demographically representative of the United States, the successes and challenges shown here have potential to inform institutions with a similar profile and facing similar challenges related to sheer size and complexity. This study also utilized a participatory development approach, and its successes—both in the curricular context, and also in the projects that emerged directly from the research (a student video capturing sustainability definitions, a first year sustainability seminar, and reference in the PPCS university sustainability goals)—suggest that perhaps participatory development approaches are a fruitful avenue for universities that face large-scale complexities and are characteristically slower to change.

Through looking deeper into the institutional culture and context, engaging participation from key stakeholders, and narrowing in on a university vision for sustainability and its components, this study was able to provide a solid consensus-driven framework for curriculum development and implementation. There is now a larger conversation among OSU's sustainability leaders, emphasizing the importance of looking at the bigger picture of sustainability, using critical thinking and problem solving skills. In just this study alone, over 20 individuals engaged in a conversation about what sustainability means to Ohio State, generating over 50 pages of feedback. While this project recommends a framework of essential sustainability concepts, it is also clear that the complexity of the word and the value of the conversation at Ohio State, and universities worldwide, should not be underestimated.

As SD in higher education continues to be implemented, the volume of case studies invites some effort to begin to differentiate recommendations and strategies that are likely to work in different cases and contexts. Research moving forward should confirm whether some elements of the process at Ohio State can be equally effective at other large, American universities. Similarly, Participatory Development research approaches can also be further examined for their suitability in different contexts.

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Author Contributions

Both authors directly participated in the original idea, planning, and implementation of the project. The research was performed and analyzed by Clair Bullock. The paper was written by Clair Bullock, with significant contributions and suggestions made by Gregory Hitzhusen. All authors have read and approved the final manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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