

Interdisciplinary Methodologies to Teach Sustainable Design: Case Studies from a “Sustainability University”

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INTRODUCTION

The United Nations agenda 2030 features 17 sustainable development goals (SDG's) which can be utilized to guide the behavior and aims of the world to achieve sustainable outcomes. SDG 4 is quality education and education for sustainable development is a key characteristic within this. Education within schools and high schools is vital and becoming more common across the world, but at the higher education level it is important for students to continue this education. Students should critically evaluate the demands of sustainability and apply them to their chosen careers and futures to bring about the changes needed. For realistic global change, sustainability aims need to be infused throughout all aspects of our world. This paper discusses a collaboration between educators from two disciplines, sustainability and design, and the results of the first three years of an ongoing collaboration between faculty and students. This collaboration is framed within the context of a university which is committed to sustainability education and has prioritized sustainability operationally and academically since its inception. This paper uses a critical reflective approach drawing from the experiences of the faculty and feedback and observations from student participants.

Sustainability is a multi-faceted concept with varying and wide-ranging definitions and interpretations. Likewise, design has multiple viewpoints, applications and perspectives alongside different ways of approaching the topic. It is within this flexible and diverse framework that this collaboration seeks to create new spaces for learning and enhance the integration of sustainability as a concept within the lives of our students and community.

Background Information: A “Sustainability University”

In master plans and publicity materials, Florida Gulf Coast University (FGCU) describes itself as the “environmental university”¹ which “promotes and practices environmental sustainability”². A relatively young public university, FGCU officially opened in 1997 and has prioritized sustainability education and practice from its inception. Many educational approaches to sustainability function in a discrete manner with individual majors or courses of study and little integration. Similarly, with educational institutions that incorporate sustainability goals (many institutions do this now) these are framed as disparate procedural or goals outside of the education of students. FGCU has taken a different approach and seeks to integrate

¹ Florida Gulf Coast University Campus Master Plan 2005. Accessed at <https://www.fgcu.edu/adminservices/facilities/masterplanfiles/FGCU2005CMPVol1.pdf>

² Florida Gulf Coast University Strategic Plan 2017-2022, p.22. Accessed at <https://www.fgcu.edu/about/leadership/officeoftheprovoost/files/bot-approved-fgcu-2017-2022-strategicplan-121117.pdf>

sustainability throughout all areas of the university. Used as a model to plan the physical and operational structure of the university, sustainable aims guide campus planning and daily procedures. Sustainability education is embedded within the framework of academics at the university. Although many educational institutions have adopted sustainability goals as an afterthought, FGCU was established with a sustainability goal, enabling a greater incorporation into the structure, processes, and academics of the university.

The first master plan for the university was created in 1994 and firmly established the goals of the university as a location which focuses on environmental issues, which was maintained through subsequent revisions of the master plan. The campus was surrounded by wetlands and uplands preserves which are maintained with the aim of making the university a living laboratory providing a space for students to conduct research and well as appreciate the local surroundings.³ Built in a suburban location and having an initially predominantly commuter student cohort, the campus was designed to allow for cars to get to campus, but to limit vehicular access to the campus core. A design with an exterior ring road and parking lots and the core of campus as a walkable zone encouraged students, faculty, and staff to rethink transport. The main campus is accessed through walkways and a series of boardwalks which were chosen to "...serve as a reminder that the campus sits in the midst of a sensitive ecological area".⁴ In addition, these boardwalks allowed the natural seasonal flooding to occur, helping to limit the impact on local ecosystems. On campus, structured landscaping is organized to mimic the natural environment, providing habitats, and limiting the impacts of built infrastructure on local ecosystems. Campus management also prioritizes native plants for landscaping and actively works to control invasive species, providing more opportunities for sustainability education on campus.

The campus infrastructure has several sustainability features which aim to model the potential for sustainable development. There is a 15-acre photovoltaic solar field providing electricity to three major buildings on campus and reducing the university load on local power infrastructure by 18%.⁵ Rather than rely on traditional air conditioning, most of the university is provided using chiller technology which stores ice and pumps cooled water through a network of pipes. Chiller technology has many advantages from a sustainability perspective, it limits the use of chemicals which can add to greenhouse gasses and any leakages which occur are of less damaging water/glycol solution. This technology was less common at the time and required a major up-front investment and significant commitment from the board of trustees. It has proven to be a challenge limiting expansion (which is not necessarily a bad thing) and necessitating a larger economic investment prior to additional campus expansion.

Many of the buildings on campus are certified as LEED (Leadership in Energy and Environmental Design), with Seidler Hall certified as Platinum in 2010. This highest certification level is awarded to an active laboratory building which is challenging to accomplish with required lab chemicals usage. In addition to this, two teaching buildings are gold, and student dorm buildings and recreation center are silver certified. The university is also a partner with Tree Campus USA, with an annual tree planting event and processes to track newly planted

³ Florida Gulf Coast University Campus Master Plan 2005. Accessed at <https://www.fgcu.edu/adminservices/facilities/masterplanfiles/FGCU2005CMPVol1.pdf>

⁴ *ibid*, p.240.

⁵ Florida Gulf Coast University, Buildings and Site Locations. Accessed at <https://www.fgcu.edu/adminservices/facilities/buildings-sitelocations>

trees and their carbon offset. As well as planting trees, the landscaping across campus focuses on native plants and mimicking natural services.⁶ The university has also pledged to the carbon climate leadership commitment in 2007 and is a participant in the real food campus commitment. Internally a shared governance approach created the *Sustainability and Resiliency Council* (SRC) which ensures the university maintains the sustainability goals established in the master plans. There is significant communication and input from faculty, staff and students to expansion and building projects. External processes to evaluate the standards of sustainability at FGCU include the *Association for the Advancement of Sustainability in Higher Education* (AASHE) which awarded the university a gold rating in 2014 and 2017 based on the *Sustainability Tracking, Rating and Assessment System* (STARS) report.

Within academics, the university also establishes sustainability at the heart of its mission: “Integral to the University's philosophy is instilling in students an environmental consciousness that balances their economic and social aspirations with the imperative for ecological sustainability.”⁷ The cornerstone in this approach is the course *University Colloquium: A Sustainable Future* which was established as the capstone interdisciplinary education course for the university since its founding. The course is an upper level seminar style course with a research essay meeting undergraduate writing requirement. The course is required for all majors at the university prior to graduation and is structured to reinforce and synthesize sustainability education. Taught from an interdisciplinary perspective, the course enhances the viewpoint of sustainability as an integrated practice which can be applied to multiple areas of life. Structured around the three spheres of sustainability including people planet and profit allows the course to speak to students from disciplines outside of the natural sciences and find applicable material relevant to their lives.

To support and encourage sustainability research by both students and faculty, FGCU established the Center for Environmental and Sustainability Education. This center provides a hub for students, faculty, researchers, and community organizations to collaborate on sustainability issues. The center also partners with regional schools, businesses, and non-profit organizations to advance the aims of sustainability within the region. Faculty can participate in workshops and trainings via the *Integrating Sustainability Across the Curriculum Academy* (ISAC) which supports and trains faculty to incorporate sustainability education within their existing courses. This has led to many courses including a sustainability component which perhaps would not have contained such information with over 200 courses in the fall 2020 containing a sustainability component from art to business. The sustainability focus of the University is having a positive impact on students with 73% of recent graduates identifying that FGCU has influenced them to maintain sustainable lifestyle practices and 69% of students identifying the *University Colloquium* course as being influential on their sustainability behaviors.

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⁶ Florida Gulf Coast University Strategic Plan 2017-2022. Accessed at <https://www.fgcu.edu/about/leadership/officeoftheprovoost/files/bot-approved-fgcu-2017-2022-strategicplan-121117.pdf>

⁷ *ibid*, p. 5.

⁸ Alumni Survey conducted by Scarborough Simpson, 2019.

METHODOLOGY

Sustainability as a concept is multi-faceted in nature with multiple understandings and perspectives of the concept, which suits an interdisciplinary approach (Jones et al. 2010). The faculty members began planning for the project around a year before the first collaboration with students was conducted and the methodology has been adapted based on experiences. There have been several examples of the value of interdisciplinary education to teach sustainability explored within academic journals. This collaboration drew in inspiration from several sources, reflecting the interdisciplinary nature of the project and the faculty backgrounds. Howlett et al, (2016) illustrate the value of an interdisciplinary education to personalize sustainability and encourage reflection. Cotton and Winter (2010) review the benefits of approaches to teaching sustainability and provide examples of pedagogies in practice. This offered an avenue to explore potential incorporation of activities for this collaboration in multiple ways. The regional trends highlighted by Wals and Blewit (2010) offered a justification for an interdisciplinary approach to the project.

For this project, interdisciplinary pedagogy is framed as a process which moves beyond a structural perspective and draws from a more flexible epistemology. Sustainability impacts a variety of different aspects of life; environmental, economic, and social, with the resulting conflicted perspectives on each. The impacts of sustainability (or lack of) are felt in different ways by different people, necessitating a post-structural approach to solutions. Reflecting this diversity of lived experience, an interdisciplinary approach acknowledges that single disciplinary foci are not adequate to tackle these global issues we face. A perspective which acknowledges multiple viewpoints and experiences will lead to a more rounded and applicable set of solutions which will necessarily be constantly changing and adapting. Pedagogically, themes which are integrated across the curriculum lead to a deeper understanding of the topic and more rounded critical thinking (Aktas 2015; Loschavio dos Santos 2017). For sustainability to become part of our future development, it should be infused throughout the educational experience (Brudermann et al. 2019; Lewis 2019).

Within the design field, the theory of design thinking informs how the collaboration was structured to seek solutions to problems (Brown 2009). Design thinking aims to identify an issue and create a solution or set of solutions to address the issue. Part of the process is synthesizing ideas and brainstorming solutions, but for design to function well, designers must have a rounded and connected education. This suggests an interdisciplinary approach: "For new ideas to be meaningful, innovative and well grounded, designers must be educated in issues that go beyond the traditional boundaries of design" (Walker 2006,12). Within the Digital Media Design (DMD) program at FGCU, students are exposed to several different avenues of exploration and this collaboration extended that pedagogical diversity.

Design influences much of modern life and can function as a tool to change behaviors and illicit positive responses and activities (Paperneck 2019). In this way, connecting design to sustainability has the potential for the social change which is necessary for the future. It is important for design to be embedded in social values and to reflect as well as construct societal aims. In this way, design is socially constituted: "...a design's success is directly connected to how well the design meets the preferences of people in the context of society, economics, and the environment; people being the ultimate users of design"(Giard and Schneiderman 2017, 123). Given the connected nature of sustainability, design has a central role to foster innovative and creative approaches to restructure future activities.

How to incorporate sustainability thinking within existing curricula structures is a challenge when traditional siloed thinking shapes much of higher education. Giard and Schneiderman (2017) illustrate the difficulties of integrating sustainability into the design curriculum and identify potential approaches including collaborations between sustainability and design experts. This collaboration drew inspiration from the studio model incorporating sustainability approaches within studio practice. This allows for research to be embedded in practice and for students to learn through teamwork and collaboration (Ueda 2018). Pedagogically, sharing thoughts and ideas, and allowing a level of selection and refinement is an effective process, specifically within design, collaborations foster a more open approach to solutions (Brown 2009). The collaboration also sought to extend undergraduate student research outside of the classroom and provide an opportunity for student research to be shared more widely both within and outside of academia.

The broader aims from a student learning perspective is to expose a greater number of students to research conducted by their peers. In the traditional classroom a student conducts research for a term essay and this is then read by the faculty member, and perhaps shared with the rest of the class. This project identified that there is a greater potential for exposure of this research to the rest of the students in the course, the students in the partner course and to wider campus and community who may be exposed to the research through the created design projects. This helps to instill sustainability as a normative behavior across campus and the wider community, moving it from a discrete project with a limited audience to a wider level of exposure.

RESULTS AND DISCUSSION

For more than two years, over 200 students from multiple majors have collaborated across several courses at FGCU. Students from the *University Colloquium* course were asked to conduct their research based on a variety of different guidelines for each course. The students were given a significant amount of freedom when conducting research, allowing them to select topics that would resonate with them. The students could focus on aspects within a given topic that they felt was most important. This process of selection and extrapolation allows for a synthesis of complex ideas to be presented. The research was summarized into data sheets and summaries which were shared with their partner design students within DMD courses. The design students' task was to visually interpret the research and make it accessible to a wider audience across a variety of media. The design projects were presented as vinyl decals, animations, and websites. The goal of the design projects was to present data and research in a way that would resonate with the widest possible audience and demographic.

Global Sustainability

The first collaboration with design students was within an upper level graphic design 2 course. The students within the *University Colloquium* course were given the brief to identify a country actively engaged in sustainability and research the approaches taken. The identification of the concrete steps taken by a country involved students knowing the broader sustainability issues and identifying which solutions had been chosen. This involved critical thinking and evaluation of research materials on the part of the research students. Some focused on general aspects of sustainability, others were more direct and chose a specific aspect of sustainability such as food or water. These findings were prepared as a short document, with bullet points to synthesize complex ideas. This process engaged the students in a wider understanding of issues and evaluation of what they considered to be an important focus within the issue. This ensured that

the students would critically engage with the topic selecting and evaluating what they considered to be of value. This is a crucial aspect of the project as it encourages perspectives from the generation who are going to be most affected by climate change, to have their perspective heard. What resonates with a twenty-year old student may not be what would resonate with a faculty member, but the responses would be more likely to resonate with the same or similar age group spurring action, critical thought, or dialogue.

For the colloquium students' there was significant freedom to choose the country and what aspects of sustainability they would focus on. Students worked individually on the research; some students chose to compare countries with the US others chose to represent the data from one country. Design students were then provided a summary of the sustainability actions of the research country and were tasked with creating a visual representation of the research. The visual responses to the data were open, the design students were given some constraints such as the sizing of the area of install. This translation process allowed for a further extrapolation of the information as it was abstracted into visuals. Some students approached the project in a more formal and literal way by focusing on numbers and data. Others took a more abstracted, personal, and emotional interpretation of the data. Other students utilized pop-cultural references as an approach of making the data more accessible to a wider audience. All the design students were engaged in a continuation of the sustainability learning and synthesis of ideas and approaches from the partner course. Students from both courses responded well to the assignment and indicated they had learned new information about sustainability, and many were surprised by what they learned about the given locations.



Left to Right: Aimee Farmer, Raquel Holness, Haley Levy

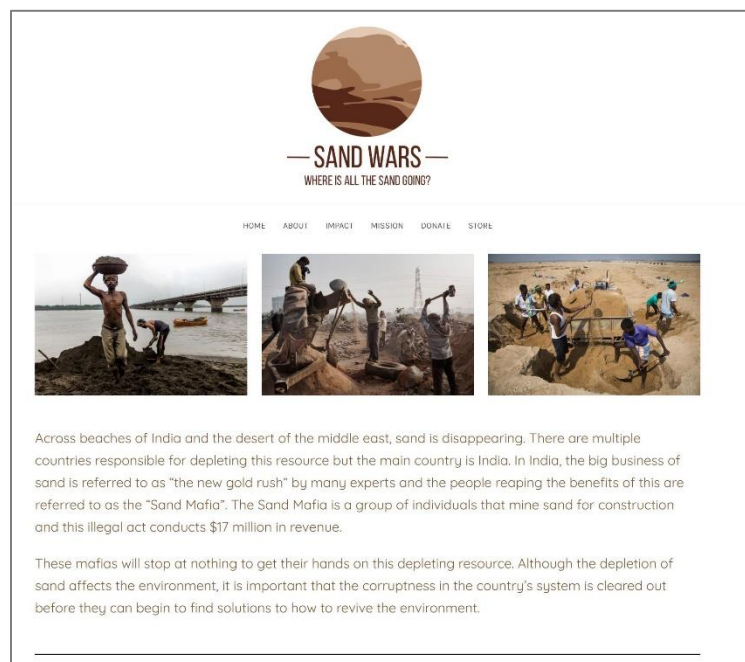
The design aspect of the project was realized as large format vinyl decals which were installed on the FGCU campus outside the theatre and art gallery which is a high traffic area. The

graphics helped to disseminate the research conducted by the two groups to the wider campus community.

Environmental Justice

The second project was a collaboration with students in an environmental justice themed course and students in the course web design 1. Students identified potential environmental justice issues drawing from class lectures and reading materials, then conducted research and prepared information for their collaboration partners. The partner design students adapted the research by developing highly visual websites which would act as documents for community responses and disseminate the major issues to a broader audience. Students in this collaboration were surprised by the results of the student research and many of the topics under discussion were new to the students in both courses. Some subjects were known to students broadly, but the data added significant depth to that knowledge base. As an example, the students learned the extent of palm oil use in products they used daily and the social processes inherent in the production of those products. They were then able to draw connections between the research and their personal consumption patterns. These connections are an important part of any interdisciplinary collaboration, encouraging students to see their college work as part of their lives rather than discreet courses with little correlation to the world outside of the university.

Project example 1; Hadassa Romero and Leah Riggle created a website *Sand Wars* which illustrated the issue related to the theft of sand for construction and the resulting environmental impacts. They synthesized the research information and highlighted the impacts to the environment and society and identified potential solutions to the issue. The design students presented the data in an appealing and accessible format that helped convey the message of the research to a wider audience.

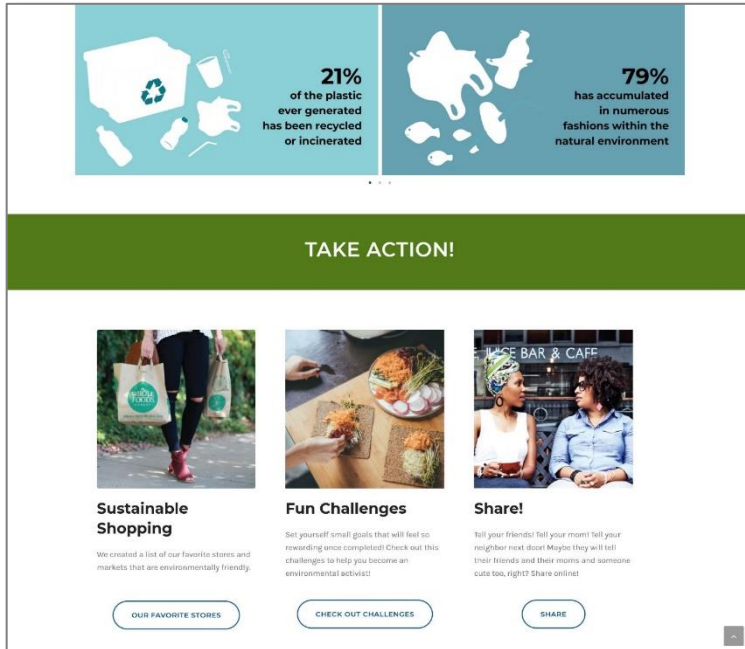


— SAND WARS —
WHERE IS ALL THE SAND GOING?

HOME ABOUT IMPACT MISSION DONATE STORE

Across beaches of India and the desert of the middle east, sand is disappearing. There are multiple countries responsible for depleting this resource but the main country is India. In India, the big business of sand is referred to as "the new gold rush" by many experts and the people reaping the benefits of this are referred to as the "Sand Mafia". The Sand Mafia is a group of individuals that mine sand for construction and this illegal act conducts \$17 million in revenue.

These mafias will stop at nothing to get their hands on this depleting resource. Although the depletion of sand affects the environment, it is important that the corruptness in the country's system is cleared out before they can begin to find solutions to how to revive the environment.



Project example 2; Design student Izzy Baquerizo was provided with information about plastic pollution and her response was to develop a website titled *Culture Shift*. The aim of the site was to identify practical solutions to reduce plastic waste. To make the website resonate more with college-aged students, Izzy created a non-profit company for the site in order to amplify the authenticity of the subject and suggest potential routes for organizations to take when tackling this subject. The project illustrated approaches to raise awareness by connecting communities and age groups as activists against plastic pollution.

Global Sustainable Design

Collaboration three had students taking colloquium and the course global sustainable design concurrently as part of a study abroad group. Students travelled to Europe to explore sustainability as it was practiced outside of the USA. Upon their return they applied what they had seen, experience and learned from the trip and were tasked with translating those approaches to South West Florida. Whilst on the study abroad trip the focus was to visit specific locations and observe sustainability approaches from the European perspective as well as meet with educators and designers within the discipline of sustainability. For the realization of this project students performed the function of researcher and designer concurrently.



Project example 1: Emily Gonzalez and Michelle Marell created a plan for *DREM*, a flexible drinking and dining space drawing its inspiration directly from *Reffen* in Copenhagen and similar projects elsewhere. Their idea included upcycling shipping containers into low-cost spaces for food-truck style dining, art creative spaces, community gathering areas and live music. Construction would use upcycled building material, low carbon emission fuel/energy and community volunteers to construct the space. Because of the low cost of building the rents for businesses would remain low, fostering social sustainability and supporting small, local businesses.

Project example 2: Leah Riggle drew from her experiences using reusable coffee cups and wanted to come up with a design that would encourage their wider use. Leah's solution was to build on the desire of students and others to want fashionable, personal or customizable products. Inspiration came from a chance meeting with a major fashion magazine editor on a flight and an exhibition in the *Victoria and Albert Museum*, in London. After the conversation Leah designed recyclable paper sleeves which would allow drinkers to "change" their coffee cups to match their mood or fashion, reducing the desire to purchase disposable cups. The sleeves could also be used to wipe down the cup after use to prevent liquid drips when placed in a bag to further encourage reuse. The cup and sleeve would become part of the drinker's everyday wear. To further connect with the college-age target audience Leah designed a 'selfie backdrop' to encourage coffee drinkers to photograph themselves with their cup designs to post on social media and create a trend.



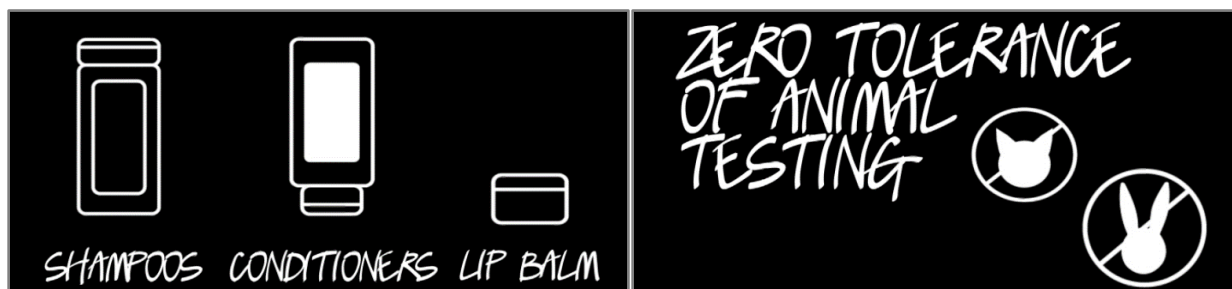
Evaluating Sustainability

The brief for collaboration four asked students to evaluate the sustainability claims of an organization, government, or company. The students self-identified the organization allowing them to choose based upon personal interest. The aim of this selection was to identify companies or organizations which were important to this age group and to expose students to the realities of their daily consumption. The students could choose which aspects of the organization to focus on; they could choose to present a negative slant, a balanced approach, or a positive approach. It was expected that students would use this as an opportunity to 'uncover' the negative and failed sustainability claims of companies and corporations. Overwhelmingly in their research students chose to focus on the positive aspects of the companies' sustainability efforts, with very few choosing a balanced or more negative approach. This mirrors findings within sustainability education which highlights how important positive thinking can be to illicit change (McPhearson, Iwaniec & Bai 2017). It could also be a symptom of what Nudge theory pioneers Thaler and Sunstein call "Unrealistic optimism" (2009, 33), students who had existing mostly positive relationships with the companies consciously or unconsciously wanted to reinforce that relationship rather than discover possible uncomfortable truths. This behavior by the students could be a desire to be positive about future outcomes and identify improvements made, embracing positive change rather than focusing on the negative or more critical aspects. In their research students tended to choose companies they liked or used, only one student within this cohort chose a company with a generally poor environmental reputation (Monsanto) and critiqued their approach to sustainability.

As with previous collaborations the design students were provided with a summary of the research citing the main claims of the organization and were given limited background information. When these students were provided with the overwhelmingly positive information, many were unhappy with the positive slant of the research and felt there was not a balanced representation of the organization's efforts. The design students felt that the research came across more as public relations documents written by the companies rather than student research. This could be illustrative of a political slant of tighter community of design students, compared to a wider sample of students from multiple disciplines within the colloquium course. It could also be reflective of the disconnect between a student receiving research from a peer (rather than a trusted authoritative source) and questioning the depth of research. The goal of the design students was again to make the research accessible to a wider audience. In this case through animation and motion graphics. The design students created 2-3-minute animations that could be posted across a variety of media from online video repositories such as YouTube or Vimeo, to being embedded in website or distributed across social media.



Project example 1: Victoria Walrod and Sheena Heuer created an animation illustrating the steps taken by Starbucks to incorporate sustainability into their corporation. They used the easily recognizable colors and fonts associated with Starbucks as a method of reinforcing the subject of the video for those who may come across the video half-way through.

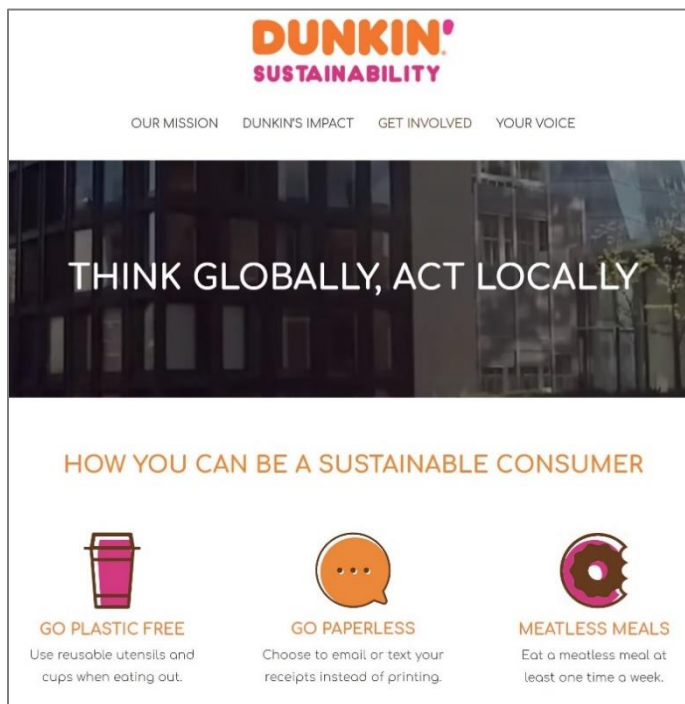


Project example 2: Kaitlin Hynoski chose research on the company Lush mostly because she was already connected (positively) to the brand and used its products. Her animation used stark black and white coloration as a contrast to the company's usually neutral and natural product advertising. She highlighted the already well-known sustainability aspects of the brand, but she added personal touches and stories to connect an audience to the research emotionally.

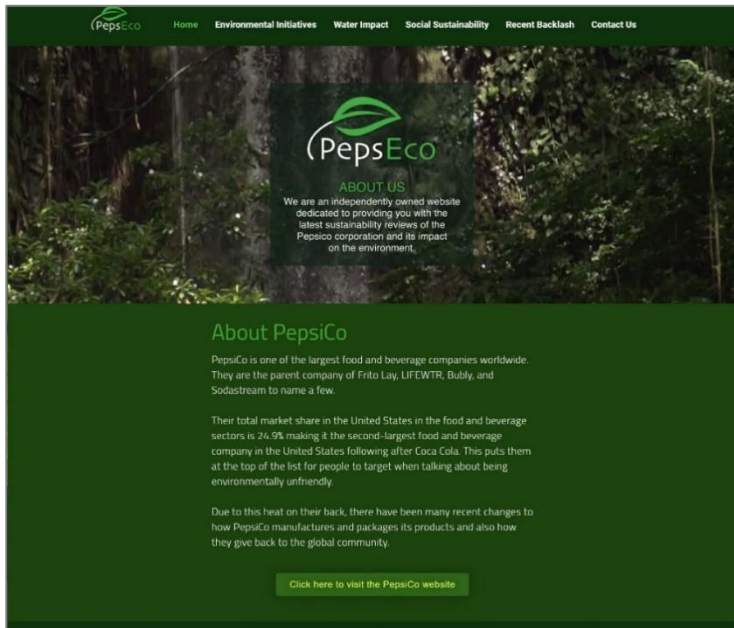
Websites for Sustainable Futures

Collaboration five merged the research guidelines from the environmental justice and the evaluating sustainability collaborations. The colloquium students were instructed to self-identify and then research the sustainable claims of institutions, companies, or organizations. This project was titled *sustainable futures*, and students were instructed to focus on identifying

practical approaches being taken by their subject that were advancing sustainability. The design students translated this research into websites illustrating what the company or organization was doing as part of their sustainability initiatives. As with the prior collaboration, many students chose to focus on positive aspects of sustainability efforts, rather than negatively critique the companies and again the design students pushed back on what they felt was positive-only research data. Learning from the previous collaboration, the design students in this collaboration were tasked with expanding the project research themselves. They were instructed to research counter points and balance out the research from the colloquium students. This was a useful and thought-provoking exercise for the students as they initially critiqued the approach of the other students, only to discover that there was a paucity of available information about the companies or organizations. It was challenging for the design students to evaluate the claims of organizations in the amount of time they had for the project and deeper information was scarce. This reinforced the concept that the websites created could be vehicles for further exploration by students and wider audiences, and that the websites should distance themselves from the subject to connect to additional research both negative and positive. Having the design students add to the existing research increased the impact of the project as the students learned of the many challenges involved in researching claims of organizations and businesses who control their own image, especially online.



Project example 1: Aracelly Peralta and Meg Brunner. This website imagines how a corporation such as Dunkin' Donuts should surface their positive sustainable impacts but also be honest about the work they have yet to do. The focus of the website was to propose that Dunkin' should be more open about inviting their customers to encourage Dunkin' to increase their sustainable outlook. Aracelly and Meg's website included several touchpoints for customers to become involved in the conversation about sustainability. It proposes a process and facilitates conversations about what customers, of all ages, want to see from the company.



Project example 2: Chebioam Vieira chose to imagine a non-profit *PepsEco* whose focus was to make corporations answerable to their customers and become more transparent in their actions on sustainability. The site provided a model for how a non-profit might approach disseminating information, both positive and negative. It could facilitate discourse between customer, stakeholders and the company circumventing the usual filters of public relations. The site would become a repository of data tracking improvements in sustainability as well as giving a voice to people who want to hold businesses to account.

CONCLUSION

Sustainability impacts all areas of our lives and the need for sustainability to be infused throughout our educational endeavors is never more relevant. For sustainability choices to become widespread and normalized, sustainability discourses must become natural and universal. We should not 'think' of sustainability choices, they should become second nature and part of regular daily choices. This can be achieved through bringing discussions of sustainability into as many processes and activities as possible. This collaboration sought to infuse sustainability thinking across the academic community (and beyond) by expanding student conducted research outside of the classroom and incorporating creative interpretation. Design can present information in ways which speak to the audience in a more personal and direct way, opening up the opportunity for personal and therefore societal change.

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