Biophilic Design at CSUMB:

Report of findings from a campus photovoice assessment, stakeholder interviews, and focus group

Submitted to the CSUMB Sustainability Office, Brightworks Sustainability, and the Living Future Institute as part of the CSUMB Living Community Challenge

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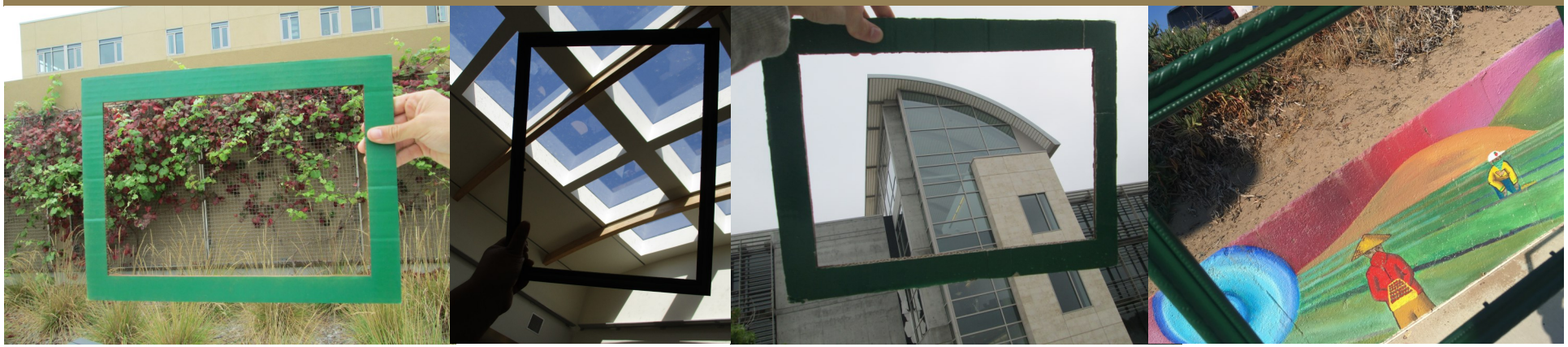
California State University
MONTEREY BAY



ENVIRONMENTAL STUDIES WORKING PAPER SERIES #4

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The mission of the Environmental Studies Program at California State University Monterey Bay is to develop students and communities with the knowledge, skills, and compassion to promote social and environmental justice and sustainable communities.

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With thanks to Mason Fernandez for facilitating an extra focus group, Jordin Simons for her graphic facilitation in the focus group, and Lacey Raak for her vision and support in this initiative. And to the late Stephen R. Kellert, for getting us all started.

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Introduction

The Living Community Challenge is a framework for master planning, design, and construction. It is a tool for promoting symbiotic relationships between people and nature in the built environment. In 2017, California State University Monterey Bay agreed to take the Living Community Challenge to inform its master planning and growth.

One transformative aspect of the Living Community Challenge is its call to affirm natural systems through biophilic design. As framed by Dr. Stephen R. Kellert, biophilic design moves us beyond sustainability to also create environments that are restorative—for people and other beings in the natural world. Kellert developed this framework in part because he knew that it was only through the built environment that we could address many systemic disconnections between people and their environments. Biophilic design celebrates people's connection to nature through its integration into landscapes as well as buildings themselves. Kellert identified six elements of biophilic design (Table 1). These include:

- Environmental Features
- Natural Shapes and Forms
- Natural Patterns and Processes
- Light and Space
- Place Based Relationships
- Evolved Human-Nature Relationships

Kellert believed that biophilic design was a way for nature and place to provide inspiration, so that the built environment conveyed local meaning, history, geology, or natural elements that evoke positive human-environment relationships. He emphasized that there is nothing new about biophilic design – it has been employed across architectural history and styles from historic times to the present.

Biophilic design has been applied intentionally on a wide range of campuses in both interior and exterior environments. For example, Yale University incorporated sustainably harvested wood from its school forest to line the interior walls of Kroon Hall, where Dr. Kellert taught (Kellert & Finnegan, 2011). Keene State University incorporated a geology courtyard that utilized local stones in its paving (Dirtworks, 2006). Arizona State University renovated a naval base by creating a series of desert or riparian drainages and courtyards adapted to microclimates so that each courtyard reflected some aspect of the academic department; as one example, agribusiness had a citrus grove that utilized Moorish irrigation channels (ASLA, 2012). In so doing, they were able to grow a diversity of plants the mimicked local ecosystems. In Washington state, the outdoor learning center Islandwood incorporated a wide range of biophilic design elements into its buildings; one of the most popular features is a

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Table 1. Biophilic Design Elements and Attributes (Kellert, 2008)

Environmental Features	**Natural Shapes and Forms**	**Natural Patterns and Processes**
Color		Sensory variability
Water		Information richness
Air	Botanical motifs	Age, change, and the patina of time
Sunlight	Tree and columnar supports	Growth and efflorescence
Plants	Animal motifs	Central focal point
Animals	Shells and spirals	Patterned wholes
Natural materials	Arches, vaults, domes	Bounded spaces
Views and vistas	Shapes resisting straight lines and right angles	Transitional spaces
Façade greening	Simulation of natural features	Linked series and chains
Geology and landscape	Biomorphy	Integration of parts to whole
Habitats and ecosystems	Geomorphology	Complementary contrasts
Fire	Biomimicry	Dynamic balance and tension
		Fractals
		Hierarchically organized ratios and scales
Light and Space	**Place-based Relationships**	**Evolved Human-Nature Relationships**
Natural light	Geographic connection to place	Prospect and refuge
Filtered and diffuse light	Historic connection to place	Order and complexity
Light and shadow	Ecological connection to place	Curiosity and enticement
Reflected light	Cultural connection to place	Change and metamorphosis
Light pools	Indigenous materials	Security and protection
Warm light	Landscape orientation	Mastery and control
Light as shape and form	Landscape features that define building form	Affection and attachment
Spaciousness	Landscape ecology	Attraction and beauty
Spatial variability	Integration of culture and ecology	Exploration and discovery
Space as shape and form	Spirit of place	Information and cognition
Spatial harmony	Avoiding placelessness	Fear and awe
Inside-outside spaces		Reverence and spirituality

fish motif in the bathroom sinks that reminds people that all water drains to the sea. The Sidwell Friends School in Washington, D.C., integrated wetland filtration systems to its landscape and included a wildlife viewing area. Students are invited to log the species they see. In the process they have identified 12 species not previously known to inhabit the area (Derr & Kellert, 2013).

Research has documented many benefits of biophilic design, including that people experience reduced stress, increased performance and productivity, and greater sense of connection to place (Kellert & Finnegan, 2011). Studies of performance in learning environments have found that exposure to natural light or nature features increases attention, test performance, and positive associations with learning (Faber Taylor & Kuo, 2006; Kellert & Finnegan, 2011; Wells, 2000). Biophilic buildings are also associated with increased worker productivity and satisfaction (Kellert & Finnegan, 2011), and biophilic spaces are associated with increased community cohesion and cooperation (e.g., Bennaton, 2009; Coley et al., 1997; Gottlieb & Misako Azuma, 2007; Faber Taylor et al., 1998; Heerwagen, 2009).

As part of the Living Community Challenge, CSUMB is partnering with Brightworks Sustainability to conduct a biophilic design charrette in January of 2018. As preparation for this charrette, students in the ENSTU 350 Research Methods in Environmental Studies course gathered stakeholder perspectives from students, faculty, and staff at CSUMB, through a photovoice exercise, interviews, and a focus group.

Methods

Photovoice

Photovoice is a method for describing places and experiences with visual imagery. Photovoice emerged in both public health and urban planning as a tool for community members to express their views about their physical and lived environments (Derr et al., forthcoming). ENSTU 350 students used a specific adaptation of photovoice called "photo-framing," which literally frames aspects of the environment using colored frames; green frames indicate positive aspects of the environment whereas red frames indicate negative aspects (Derr et al., forthcoming). ENSTU 350 students used the photo-framing method to analyze the biophilic elements of the CSUMB campus according to the elements and attributes in Table 1. Students spent about one hour walking the campus and taking a total of 24 pictures: 4 for each of the 6 elements of biophilic design (Table 1).

Once all the photos were taken for the photovoice exercise, students uploaded the images to Google Drive folders representing each of the six categories mentioned above. Pictures were assigned to a designated folder and were labeled with a short explanation for how the image corresponded to the category. Once pictures were organized, the class as a whole reviewed all images and discussed common themes.

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Interviews

Each ENSTU 350 student was assigned two interviews with stakeholders affiliated with the California State University Monterey Bay: a professional working on campus and a student of their choosing. ENSTU 350 students were encouraged to identify a student who was not an environmental studies student to obtain a range of perspectives. Interviews were conducted in a semi-structured format, meaning that consistent questions were asked of all interviewees but in a flexible format that allows for conversational flow of ideas (Mertler, 2016). The interview consisted of four required questions and question prompts below. Some students added questions specific to their interviewees professional experience.

1. CSUMB is a place where students live and learn and where many work. Do you feel the school provides places on campus where students, faculty and staff can connect to the environment?
    - If so, where are these places on campus?
    - Are there places where these connections could be improved?
    - Are there places that connect to our natural environment?
    - Are there places that connect to our cultural and historical place?
    - What aspects of historic or modern Monterey Bay culture would you want to see highlighted on campus? Where?
2. Are you familiar with the term biophilic design?
3. CSUMB represents itself as a green school, do you see attributes of sustainability portrayed around campus?
4. What buildings or structures provide refuge for you during stressful times? What qualities do these spaces have that make it comforting?

Students conducted a total of 24 interviews over three weeks, taking notes and sometimes recording the conversation. Interviews lasted from 15-30 minutes in length. Students analyzed their individual interviews for themes, and they generated keywords to reflect the main ideas to each question. Questions were sorted and coded in the NVivo qualitative software analysis package to denote positive and deficit areas of campus across the questions and frequency of items discussed. Question 1 was coded in NVivo based on specific places and place names; cultural, historical, or natural areas. Coded text was also sorted into positive or deficit areas of campus, and by students vs. faculty or staff. Questions 2 was sorted as to whether the respondent was familiar with biophilic design and any comments they made about it as related to the campus, and whether these were positive or deficit areas. For Questions 3 and 4, students generated keywords based on interview responses. Theses were also entered into NVivo to generate word frequency clouds about sustainability and places of refuge.

Table 2. Interviewee Affiliations with Position or Major

CSUMB Professional and Faculty Interviews (by position)	**Students Interviewed (by major)**
Native American Student Club Faculty Advisor	Biology (x2)
Associate Director of Inclusive Excellence	Business
Senior Planner (a CSUMB alumnus)	Collaborative Health and Human Services
Environmental Studies Club Leader	Computer Science
First Year Experience Coordinator	Film and television
Outdoor Recreation Program Staff	Human Communications
Assistant Director, Otter Cross Cultural Center	Marketing
Return of the Natives staff	Mathematics
Faculty in Natural Sciences (3)	Psychology (x2)
Department Chair, School of Natural Sciences	
Department Chair, Visual and Public Arts	
Additional People Contacted but Unable to Schedule:	
Associate Professor, Liberal Studies	
Associate Director, Leadership Development and Student Recreation	
Presidio of Monterey, Director of Public Works	
Fort Ord Monument Manager	

Focus Group

Outside of class time, one ENSTU 350 student, Mason Fernandez, facilitated a focus group with eight Sustainability Office student/staff. These students represented environmental studies; environmental science, technology and policy; and liberal studies majors. At the focus group, sustainability staff were presented with a brief overview of the Living Communities Challenge goals, a biophilic design definition, and examples from photovoice to build understanding of the six biophilic elements. Then, using the Co-Design technique developed by Stanley King and colleagues (King et al., 1998), students were asked to envision a biophilic campus—what it would look like, feel like, smell like; who they would be there with; and what they would be doing. One of the staff, Jordin Simons, served as a graphic illustrator to draw vignettes that reflected students' visions. The focus group facilitator listed all themes on a voting sheet, and students ranked each theme as either, "Love it! Build it as it is," "Needs more work," or "Belongs elsewhere." The focus group was conducted during a sustainability staff meeting on Wednesday, October 18, 2017 from 10-11 a.m.

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Results

Photovoice

ENSTU 350 Students identified a wide range of features in the campus' interior and exterior environments that affirm biophilic design principles. The most common locations for these elements were more recent buildings such as Chapman Science Center, the Joel and Dena ambord Business Information and Technology (BIT) building, and the Tanimura and Antle Family Memorial Library (library). Most common exterior spaces include the campus quad, and particularly the landscape elements at the building-landscape threshold. Many students noticed areas on campus that provided natural processes for stormwater management. Murals were overwhelmingly mentioned the most frequently as a means of representing culture and history on campus. Existing murals depict a strong sense of place connection to history, cultural, and the marine and agricultural environments that are part of Monterey's ecology. Photovoice results are summarized in Table 3 (next page), and through the images on plates 1-20.

Interviews

Does CSUMB provide places on campus where students, faculty, and staff can connect to the environment—the natural, cultural, and historical place? In general, most respondents had both positive things to say about campus elements as well as areas for improvement. Faculty and staff assessed the campus slightly more positively than students, with 11 specific features that support connections to the environment by faculty, and 9 from students. Natural areas, the library, cultural representations (primarily through murals), the BIT building and pathways received the most positive and specific comments overall (Table 4). While most people spoke of nature connections via the outside environments, some also mentioned spaces with views of nature and natural light that facilitate these connections. These were primarily in the library, the BIT building, and Chapman Science. Two students mentioned that they like the older military buildings, and that these should be kept to promote the history of place. One faculty member said that he really likes the Quad because it has grass in the middle, and it is fringed by native plants against the buildings. The native plants soften the buildings. This same faculty member said that the "library is a disgrace" because it is the most central building on campus yet it looks like a "construction site" surrounded by gravel and dirt. He suggested that the campus do much more to restore woodlands and chaparral areas in the campus landscape. One faculty member, one staff, and three students did not feel the campus offered places to connect to nature; three of these respondents suggested ways to enhance campus plantings with more native species or opportunities to engage with nature while the other two did not seem particularly interested in this aspect of the campus environment.

Cultural and historical representations, followed by history, nature and murals, received the most comments as areas of improvement, followed by more Native American representation (Table 5). Most faculty, staff and students interviewed wanted to see more reflections of history and culture. While they spoke highly of the murals that do exist, some mentioned that some are hidden or will be torn down during planned construction. In general, they felt that there could be more direct ties to the region's cultures, including honoring the Ohlone Costanoan Esselen land and greater inclusion of military, Mexican American, and Chinese American histories and culture. The following quote reflects the sentiments expressed by

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Table 3. Resulting themes and locations of biophilic design elements from photovoice assessment

Environmental Features	**Natural Shapes and Forms**	**Natural Patterns and Processes**
Themes: flowering and/or native trees, open green space, natural spaces for walking, native vegetation, vegetation that reflects diverse cultures, natural materials on building façades, natural colors on buildings, vegetation with varied coloration Locations on Campus: campus quad, landscaping, Chapman Science, BIT building, library, residence halls	Themes: Curved pathways, curved or arched building exteriors, natural logs for seating, curved stone seating, animal statuary Locations on Campus: BIT building, library, landscaping mostly in quad	Themes: Wooden lattice work on building exteriors, hierarchical forms and ratios in windows, mimicking natural processes through gabion drainage installations, vegetated drainage swale for habitat, fossils in stone of library façade, patterned walkways Locations on Campus: BIT building, library, Chapman Science, residences
Light and Space	**Place-based Relationships**	**Evolved Human-Nature Relationships**
Themes: natural light for interior spaces, for eating, studying, and classroom settings, light and shadow from vegetated walkway, inside-outside connections in Chapman Science lounge areas, reducing light pollution in exterior environments Locations on Campus: Chapman Science, BIT building, library, Dining Commons	Themes: Murals that reflect historic, cultural and ecological connection to place, use of indigenous materials, landscape features that define building form (trees adjacent to buildings, native vegetation that frames buildings), spaces that allow connection to and experience of natural ecosystems—for studying, walking, and relaxation, historic reclaimed wood, plants representing diverse cultures Locations on Campus: library, murals at Student Center, and exterior retaining walls	Themes: aromatic native plants, sensory gardens, natural landscaping the incites curiosity or provides beauty, biophilic outdoor seating that provides prospect and refuge, using nature to control human impacts, sustainable practices—encouraging biking, recycling and compost, positive treatment of animals, natural medians Locations on Campus: Heron Hall, Dining Commons exterior, library courtyard , natural landscaping between library and CART

Table 4. Positive Aspects of CSUMB Described in Interviews

Positive Aspects	Frequency	Representative Quotes or Comments
Natural Areas	12 (54%)	• "Right here in my office is a good start, I have a nice, large view. Lots of green and blue. I enjoy it because it feels comfortable." • Specific places: Trails on campus, Fort Ord, state beaches, East Campus, the Watershed Institute
Tanimura and Antle Family Memorial Library	8 (33%)	• Library allows students to view sunsets • Looking outside, enjoying views of nature, Fort Ord wilderness • Biophilic properties of building design: open space, views, windows
Cultural Representations	5 (21%)	• "The easiest place to find it is the art around campus."
Joel and Dena Gambord Business and Information Technology (BIT) Building	4 (16.7%)	• "The BIT building is designed to be energy efficient." • Open space, high ceilings, windows and views
Pathways	4 (16.7%)	• Trails behind library allow students short immersions in nature • Bike trails that connect East and Main Campus • Fort Ord trail connections
History	3 (12.5%)	• The international building shows the history of CSUMB, "I like how the building still looks like a military building, like what we would see in the movies. . . We should keep the buildings the way they are to keep historical significance."
Watershed Institute	3 (12.5%)	• "I feel like here (at the Watershed Institute), we have places where people could connect to the environment, like the greenhouse."
Murals	2 (8%)	• "The mural in front of the VPA is unique and is updated frequently to make it fresh."
Chapman Science Center	2 (8%)	• Open space, views of ocean, colors
Quad, Sustainability Features	1 each (4%)	• "It's a nice green area for students to gather." • Provides outdoor activities for student participation

Table 5. Deficit Areas of CSUMB Described in Interviews

Deficit Areas	Frequency	Representative Quotes or Comments
Culture	8 (33%)	• "There needs to be more recognition [of culture] in the physical spaces. Not just donors that give money, but to the people who have contributed to what Monterey is today. Like Chinese immigrants and indigenous people." • "The rich culture of the Native people is not exposed, nor the history of California becoming a part of the U.S. from Mexico. The main Quad could highlight these aspects of our history." • "Anywhere there are bulletins. . . there should be more publicity about cultural environmental happenings."
History	7 (29%)	• Fort Ord is an important place in the nation, yet no one has asked what we should do to better represent it on campus, like a museum, library, or information archive. • "There's already plenty of emphasis on oters. Beaches and dunes? History in general, I don't know too much. Maybe focus on Cannery Row?"
Murals	7 (29%)	• There aren't enough murals to represent the local cultures • More murals to reflect history and culture, including military • Mural are iconic, but not in central gathering places
Nature	7 (29%)	• Green roofs and native plants inside buildings to remind people of nature • The BIT building has a crescent shaped courtyard behind it, but there is no where to sit to enjoy it • The master plan should encourage more people to enjoy nature: have to walk to school, learn different pathways, help understand and know the nature of the area • The roundabout could have native plants • Bringing native foods and plants back • Counseling center could include trips to the beach
Native American Representation	4 (16.7%)	• "We should honor the Native Americans that were here before the military." • "The World Theater used to be called 'Dancing on top of the world' in the Ohlone Costanoan Esselen language" • The Ohlone Costanoan Esselen mural is "hidden in East lounge" • We should have a plaque to commemorate whose land we are standing on • Bring native foods back as part of the landscape • Keep inviting the Ohlone Costanoan Esselen Nation to meetings, seek their wisdom, be sensitive and respectful of their ways.
BIT, Quad, Sprawling campus	2 each (8%)	• "You can't open the windows in the BIT building" • Not enough shade in the Quad, detracts from hanging out or studying • "Because the campus is very spread out, it doesn't feel like the community is together as one." • A denser campus would feel more cohesive
Other	1 each (4%)	• More windows in old buildings • More representation of the agricultural connections in Monterey County

many of those interviewed:

> There needs to be more recognition [of culture] in the physical spaces. Not just donors that give money, but to the people who have contributed to what Monterey is today. Like Chinese immigrants and indigenous people. It is important that this information is known, and the significance of the contributions of these people is how Monterey Bay statues and physical landmarks should be utilized. (Associate Director of Inclusive Excellence).

Is Biophilic Design a familiar concept? Of those interviewed, 6 of 24 were familiar with biophilic design. For those who were familiar, the library, Chapman Science, and the BIT building were frequently mentioned as biophilic spaces, as were outdoor spaces, including the Quad and Fort Ord. One faculty member said that biophilic design is "very important and sometimes overlooked when developing. It affects how we feel in our work and social environment. Humans want to be comfortable. Good design will help us focus while being relaxed and making us more productive." The campus planner added that he hopes people on campus will learn that biophilic design is more than just what's green, but also is a concept that celebrates human life and diversity:

> [The greening] is a huge part of it, a very important part of [biophilic design], but not all of it. I think biophilic should go beyond loving the natural environment that's outside of humans and loving and appreciating the natural environment that includes humans. And by that I refer mostly to social justice and I think that has a huge opportunity to inform and educate biophilic design, and I kind of get back to what I was saying earlier about designing spaces and programs that reflect our diversity of backgrounds and interests and that I believe is what people want to see and to feel that their diversity of ideas is in a safe space physically, and that can be done through design. A design that is biophilic so its appreciation, love, and support of what is life and I think that there is a nature part, but there is also a human part that we can't forget.

In terms of current campus biophilic design, one student felt that most of the focus on natural beauty was in Fort Ord, rather than on campus. One of the business students, who has spent four years taking classes in the BIT building, felt that the building did not function well for human comfort and is not a user-friendly building. "It takes too long for the windows to respond [to temperature changes]. The hallways are distracting because they are open and also the windows make projections on the screen very difficult to see." Two students were not sure if biophilic design should be a priority and thought the campus should focus on developing needed buildings first. This reflects a lack of understanding of the concept of biophilic design as well as different priorities. One respondent spoke about her own alma mater, which houses buildings from a range of periods in history to reflect the campus across time., and that the buildings helped to communicate this: "It is almost like walking through history." She wanted to see more representation of the indigenous history of land and people on CSUMB's campus as part of its biophilic design.

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Attributes of CSUMB's sustainability? The most common responses to this question were that sustainability was reflected in the new buildings (7 responses), the recycling and composting systems (5 responses each), and the emphasis on conserving native habitat (3 responses). Other sustainability features included biking infrastructure (3 responses), energy efficiency, furniture resale at move-out, repurposing the military base, social justice, and water filling stations (1 response each) (See word frequencies, Figure 1). While most responses were positive towards sustainability, there were suggestions for improving biking infrastructure: "More people need to bike and they would be encouraged to do so if more of the roads were curved and built in a way that says bikers have priority, but currently people don't feel comfortable riding their bikes." One

Figures 1-2. Word cloud reflecting frequency of keywords in response to what makes CSUMB sustainable (Figure 1, left), and to places of refuge on campus (Figure 2, right)

person interviewed felt frustrated with the lack of sustainable content on campus, "we are just being put up with by the administration." Of those interviewed, only 4 faculty and staff who work closely with planning initiatives, understood a broad connection between sustainability and biophilic design.

Buildings, structures, or spaces on campus that provide refuge in stressful times? The library (9 responses) and outdoor spaces (6 responses) were most common as sources of refuge . The library's views of Fort Ord wilderness, abundant natural light, and quiet spaces provide a source of calm and focus. The library offers a sense of "prospect and refuge," a protected space from which students can view nature but be protected from the elements. Two faculty respondents also liked the library for the social gathering spaces and being around students. They say being around the students makes them feel good, and reminds one of them of his own college experience. Five respondents said they walk in the campus' natural areas for refuge and coping with stress. One student said walking among the sculptures at the Visual and Public Arts courtyard helps him relax (See word frequencies, Figure 2). The campus planner mentioned a cypress grove outside his office as a place of refuge: "Those arches, those trees, those spaces they're not huge enormous spaces, they are not really tight crammed spaces and it's that human scale, it makes me feel safe, they make me feel comfortable, its tactile and I can touch things like trees and grass." Two respondents mentioned quiet places they could sit outside and eat lunch or relax. Two respondents did not feel that any places provided much refuge on campus. One spoke about the stress of navigating through the parking lots.

Focus Group

After the initial introduction to biophilic design, student-staff from the Sustainability Office contributed ideas through a co-design process. Students developed a total of 26 design ideas and elements (Table 6, Figures 3-4). Many of the suggestions were for means of adding more direct nature into interior spaces—a variety of plantings, water features, and natural materials; places for gathering and preparing food; and imagery that reflects local culture, history, and sense of place. The elements listed in Table 6 convey a range of spaces and amenities that would enhance students' living and working experiences on campus as well as build a sense of community on campus and to the Monterey region. The drawings also reflect a range of ways that these amenities could be designed biophilically, from an aquaponics station designed using organic shapes to living walls (Figures 3-4).

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Table 6. Design Elements that emerged during Co-Design process with Sustainability student-staff (See also Figures 3, 4)

Design Element	Love it! Build it as it is!	Needs more work	Belongs elsewhere
• Garden rooftop spot for hanging out • Self-sustaining projects, low maintenance aquaponics • High Ceilings with wooden beams • Memorable, creative architecture • Residential hall with media/white board and study capacity • Big Sur/native/field work with representational art and pictures • Large, shared kitchen to build community experience through food • Commuter lounge • Club meeting space	8 votes each (100%)		
• Murals and art about history and culture (living murals) • Two buildings connected by bridge over aquaponics • Art on trashcans • Big windows, doors that open to outdoor hallways/shelter • Mini-market by kitchen, with freshly stocked healthy foods from local farms, using otter bucks	7 votes each (87.5%)		
Large building with open room connected to smaller rooms	7 votes (87.5%)	1 vote (12.5%)	
• Natural light with plants inside, blending of interior and exterior spaces • Interior garden wall • Community spaces with hammocks • Buildings with natural courtyards in interior spaces • Koi ponds, fountains, butterfly benches • Greenhouse biome building	6 votes each (75%)		
More colorful buildings (paint)	5 votes (62.5%)	2 votes (25%)	
Wall aquarium	3 votes (37.5%)	5 votes (62.5%)	
Planting in old shoes	1 vote (12.5%)	3 votes (37.5%)	2 votes (25%)

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Figure 3. Co-Design drawings showing natural materials, integration of nature into living spaces, and biophilic shapes and forms. Specific ideas include a living wall, a student courtyard with nature and hammocks, a rooftop garden, living murals that incorporate cultural aspects of sustainability, and a biophilically-designed aquaponics living biome (See also, Table 6). Image Credit: Jordin Simons.

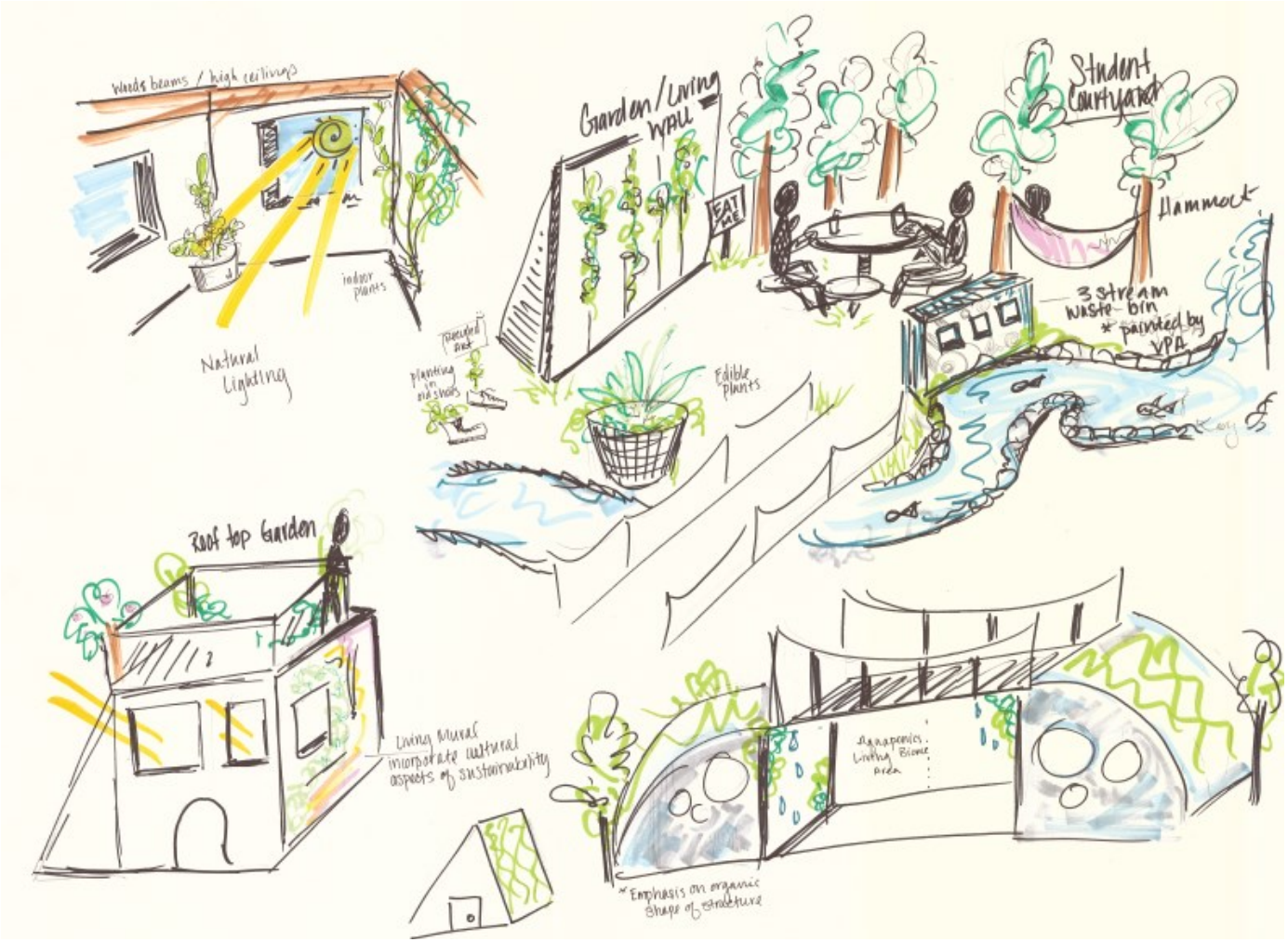
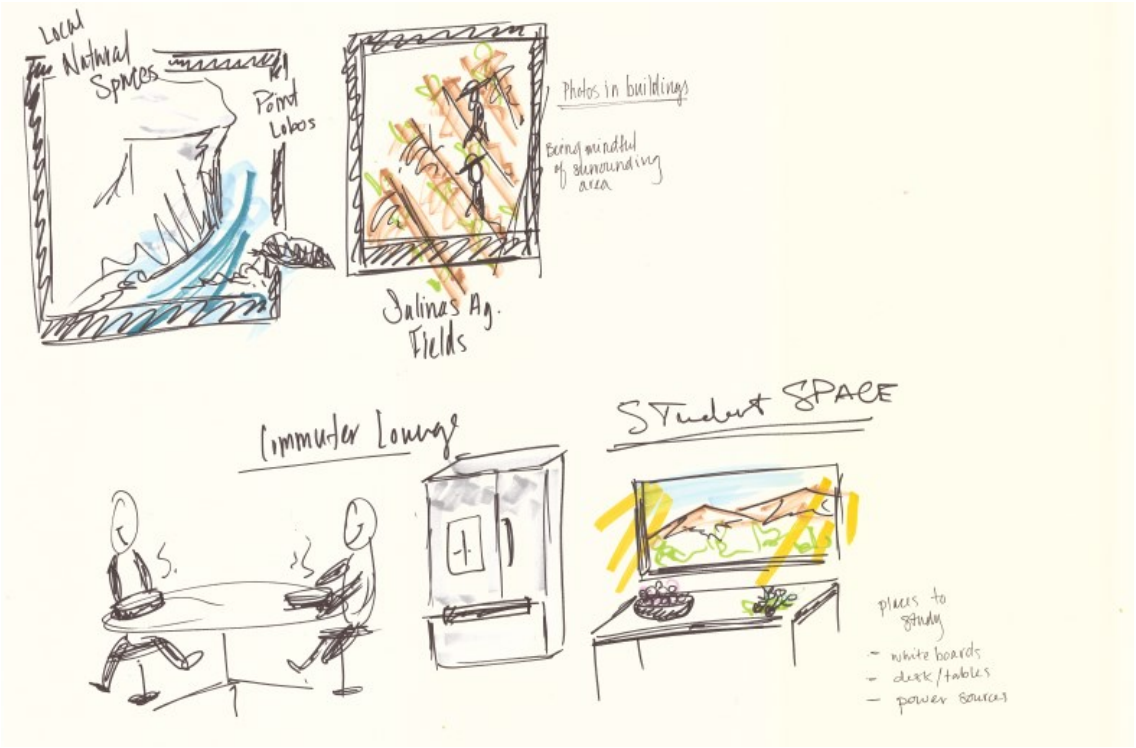


Figure 4. Co-Design drawings showing photographs that represent local natural spaces that bring mindfulness to local communities, a commuter lounge, and student space (See also, Table 6). Image Credit: Jordin Simons.



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Discussion

Overall, students, staff, and faculty were positive toward the campus environment in its connections to nature and culture, but saw ways that these connections could be strengthened, particularly related to representations of culture and history. Participants identified many natural assets. The photovoice assessment was perhaps better able to reflect these assets because students had the time to walk, observe, and reflect on the categories of biophilic design more than the interviewees. A walking tour/interview might be helpful in the future, if further research is conducted with people who are new to biophilic design. Some students reflected that while CSUMB is situated in a resource–rich region, access can be challenging for some students due to limited transportation. They reflected that increasing access routes to local beaches and outdoor environments, and building these connections into the campus community, would be beneficial. The ENSTU 350 students reflected that for international students, transportation barriers can be particularly hard, and yet the rich resources of the Big Sur coast, for example, are promoted video footage that is part of the exchange student campaign.

One of the most striking results is the importance of the library as a source of refuge. Multiple students and the ENSTU 350 photovoice assessment document the importance of natural light and views. For many, views from the library of Fort Ord were a primary source of refuge. For students who work long hours, sometimes in depraved classroom conditions, and who face many demands and stress for time and resources to succeed, the value of this biophilic feature must be underscored. Outdoor spaces were similarly important, for walking, eating, and gathering with friends, but the library views were striking both in their frequency and the concrete ways that it facilitates mental restoration for students while they work

In terms of sustainability, the word frequency cloud illustrates that people mostly think about sustainability as recycling or composting. The most frequently mentioned sustainable building was the BIT building. Only the campus planner mentioned social justice or health in relationship to sustainability and building design. As the campus develops further, more promotion of these features through course integration, a self-guided sustainability walking tour, or other means of making biophilic design and sustainability visible *and intelligible* could be beneficial in communicating the campus plan vision to all its students, staff and faculty. Some of the sustainability student-staff co-design elements illustrate how this might be accomplished (e.g., Figure 3).

In terms of longer term representations of the rich history in which CSUMB sits, one faculty member mentioned a potential museum or source for communicating this more intentionally to visitors, students, faculty and staff. This idea has also emerged in other discussions on campus. While development of a well-curated museum would take much time and resources, outreach, museum specimens, and museum interpretive displays could be integrated into a wide range of courses and departments on campus, including the School of Natural Sciences, the College of Arts, Humanities, and Social Sciences, and potentially the Scientific Illustration program. Most participants in the ENSTU 350 course and in the stakeholder interviews very much appreciated the murals on campus and want to see even more of these art works as a means of representing culture, history,

and ecology more prominently on campus. A longer term museum plan would serve a different purpose, of enriching and enhancing people's understandings, and potentially providing a more concrete means of honoring the Native Americans and military history that preceded CSUMB on this land.

The Co-Design process also revealed a desire for more spaces where students can gather and build a sense of community. They suggested a wide range of experiences, from study spaces, commuter spaces, communal kitchens with access to local, healthy food, and a hammock lounge. They also suggested creative means for adding experiences of sustainability to the campus, from a living mural to a biophilically-designed aquaponics demonstration system.

Conclusion

In preparation for the CSUMB Living Community Challenge, students in the ENSTU 350 Research Methods in Environmental Studies course gathered stakeholder perspectives from students, faculty, and staff at CSUMB, through a photovoice exercise, interviews, and a focus group. This research identified many assets on campus, including the natural ecology, murals, and newer buildings that afford views and ample natural light. However, across methods, students, faculty and staff identified ways that the cultural, historical, and ecological connections to place could be strengthened, and that these representations should be woven throughout the campus, especially in communal gathering spaces. Few participants knew about biophilic design and most consider sustainability primarily from waste reduction or building efficiency perspectives. However, the idea of biophilic design resonated strongly with many students, with some seeing this as a means to set ourselves apart as a "green" school.

Works Cited

American Society of Landscape Architects (ASLA). (2012). Arizona State University Polytechnic Campus—New Academic Complex, Mesa, Arizona. Ted Eyck Landscape Architects, Inc., Phoenix. https://www.asla.org/2012awards/199.html

Bennaton, Rob (2009). "The Re-Greening of Public Housing: New York City Housing Authority Garden and Greening Program." In Campbell, Lindsay and Anne Wiesen, eds. *Restorative Commons: Creating Health and Well-Being through Urban Landscapes*. USDA Forest Service General Technical Report NRS-P-39232-247.

Coley, R.L., W.C. Sullivan, and F.E. Kuo (1997). "Where Does Community Grow? The Social Context Created by Nature in Urban Public Housing." *Environment and Behavior* 29: 468-494.

Derr, V., L. Chawla, and M. Mintzer. (forthcoming, 2018). *Engaging Young People in the Design and Planning of Sustainable Cities: A Practical Manual.* NewYork: New Village Press.

Derr, V. and S.R. Kellert. (2013). Making Children's Environments "R.E.D.": Restorative Environmental Design and Its Relationship to Sustainable Design. In E. Pavlides and J. Wells (Eds.): Proceedings of the 44th Annual Conference of the Environmental Design Research Association. Providence, Rhode Island. May 29-June 1, 2013.

Dirtworks (2007). Honor Award for Excellence in Landscape Architecture, Society of Colleges and University Planners, American Institute of Architects, Science Center Courtyard at Keene State College. Dirtworks Landscape Architecture, L.C. http://dirtworks.us/portfolio/natural-science-center-courtyard/

Faber Taylor, Andrea and Frances E. Kuo (2006). "Is Contact with Nature Important for Healthy Child Development? State of the Evidence." In Christopher Spencer and Mark Blades, eds. *Children and Their Environments: Learning, Using and Designing Spaces.* Cambridge, UK: Cambridge University Press, 124-140.

Gottlieb, Robert and Andrea Misako Azuma (2007). "Bankside Los Angeles." In Paul A. Kibel, ed. *Rivertown: Rethinking Urban Rivers*. Cambridge, MA: Massachusetts Institute of Technology Press, 23-46.

Works Cited, continued

Heerwagen, Judith H. (2009). "Biophilia, Health and Well-Being." In Campbell, Lindsay and Anne Wiesen, eds. *Restorative Commons: Creating Health and Well-Being through Urban Landscapes*. USDA Forest Service General Technical Report NRS-P-39, 38-57.

Kellert, S., & Finnegan, B. (2011). *Biophilic design: The architecture of life*. Tamarack Media.

Kellert, S. (2008). Dimensions, Elements, and Attributes of Biophilic Design. Pp. 3-19 in S.R. Kellert, J.H. Heerwagen, & M.L. Mador (Eds.), *Biophilic Design: The Theory, Science, and Practice of Bringing Buildings to Life.*. Hoboken, N.J.: John Wiley & Sons, Inc.

King, S., Merinda, C., Latimer, B. & Ferrari, D. (1989). *Co-design: A process of design participation.* New York: Van Nostrand Reinhold.
Kuo, Frances and Andrea Faber Taylor (2004). "A Potential Natural Treatment for Attention Hyperactivity Disorder: Evidence from a National Study." *American Journal of Public Health* 94: 1580-1586.

Mertler, C. (2016). *Action Research.* Thousand Oaks, CA: Sage Publications.

Wells, Nancy M. (2000). "At Home with Nature: Effects of Greenness on Children's Cognitive Functioning." *Environment and Behavior* 32: 775-795.

Natural Features: Positive, Direct Nature and Natural Materials











Natural Features: Positive

Feeling of being in a forest

Tree connected with building

A sense of being in an open field

A Table with chairs allows you to enjoy nature while having lunch

Natural habitat

A miniature habitat garden

Natural colors

Balance b/n indoors and out

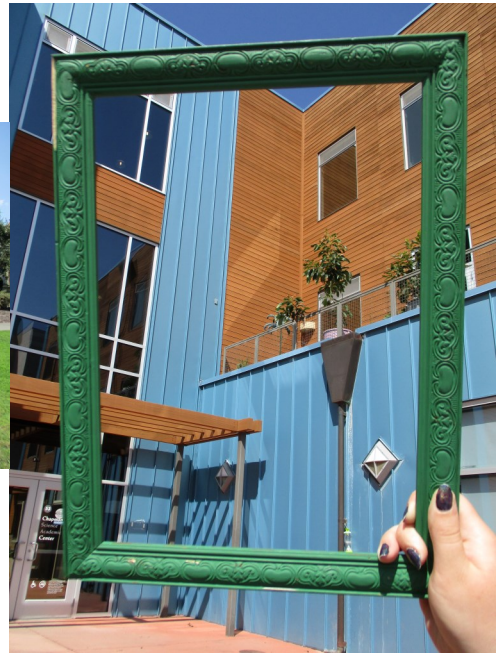
Open space incorporating trees

Natural Features: Positive

Interconnected nature paths

Growing food at Chapman (pumpkins)

Walking in open, shade for studying



Natural colors, wood slats, balcony with plants—could be better utilized

Colorful tree attracts bees and hummingbirds (above and below)

Undeveloped area

Blue sky, building and light pole

Natural landscaping, dappled light and shade (right)

Natural Features: Needs More Work

Beautiful leaf canopy but located in a far away place. Should be implemented in more places around campus.

Make it a native plant garden instead of something that is just aesthetically pleasing.

Plain space, why not native plants?

Technology outside? Could not be more un-natural

If there were tables people could be outside and us this area more.

Looks unattractive

Looks unattractive

Chalk in building interior—bad for air circulation and health

Social trails

Lacks plants, views

Implement plants or other natural features since lots of students study here.

Lack of natives, destruction of habitat

Natural Shapes and Forms: Positive




Shapes and forms of natural vegetation and natural seating integrated into landscape






Natural curves, repeating patterns

Natural Shapes and Forms: Positive

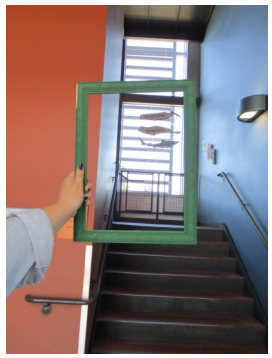


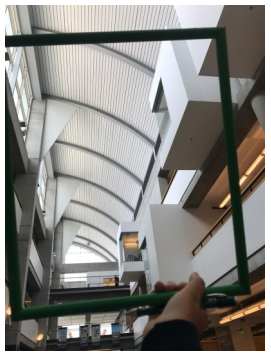

Curved pathways (exterior and interior), natural arches in buildings




Natural stone and curves; natural wood tables gives a comfortable feel, sea otters, round form with natural colors (clock)







Natural curves and patterns in brick, curved window valence, spatial harmony/animal motifs, façade greening/arched entryway

Natural Shapes and Forms: Needs More Work

Dirty, lots of gum spots. Could clean and engrave with marine life, or plants.

Unnatural shape, isolated object

Ugly, unnatural materials for bike rack

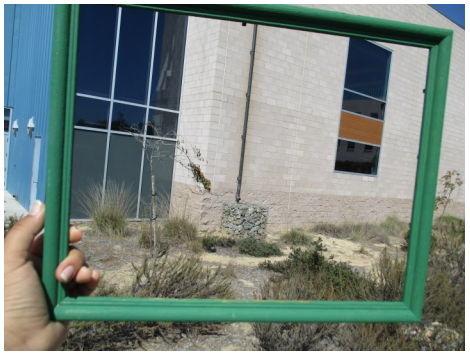
Visually unappealing

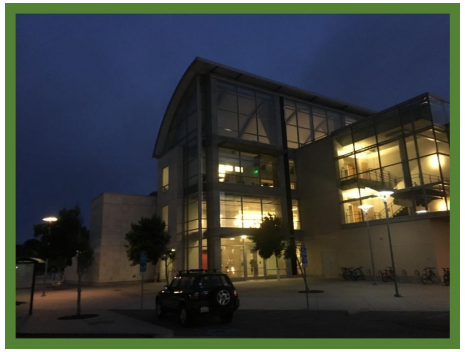
No balance, or dynamic background

Social trails damage environment

Trampled vegetation

Natural Patterns and Processes: Positive





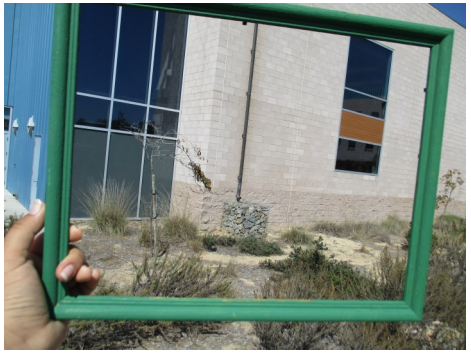
Column 1: Wood slats and patterned windows, natural drainage

Column 2: Hiking/walking trails, patterned mural representing sun and water, patterned exterior

Column 3: Fractal patterns, fossils in stone, natural drainage and habitat

Column 4: Patterned windows and façade

Natural Patterns and Processes: Positive



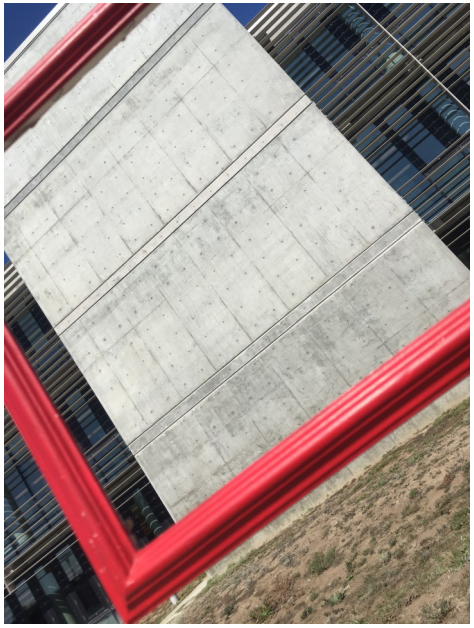
Column 1: Transition from exterior to interior via external staircase; detailing on windows (and arched forms with patterned details)

Column 2: Rock drainage mimics natural processes, nature performing human functions

Column 3: Patterned walkways Biomorphy b/n dunes and plantings simulates natural processes

Natural Patterns and Processes: Needs More Work

Nothing here, could be another potential area for studying or relaxing.

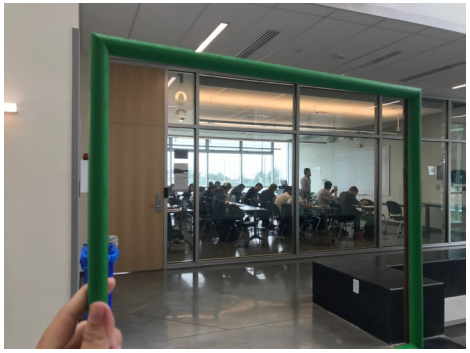


Bare slab wall, feels cold; dull colors and forms, no patterns or textures

Light and Space: Positive, Interior Study and Eating Spaces that afford views and light





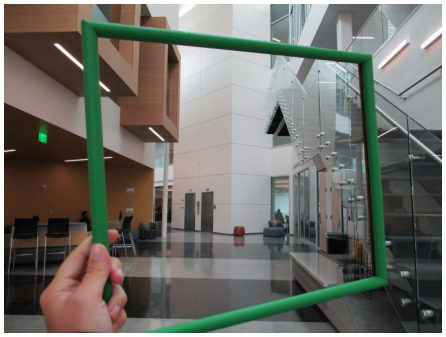
Light and Space: Positive, Exterior lighting, views and windows





Lamps that reduce light pollution, light-filled building, dappled light, big window views of sky, warm lighting

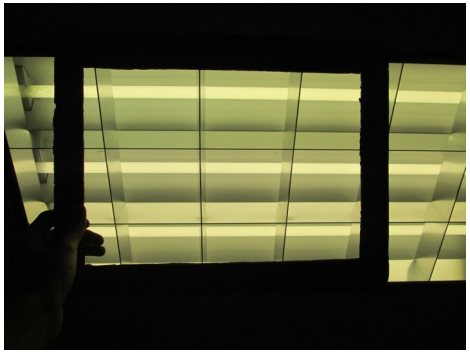


Places that allow natural light and use of space

Light and Space: Needs More Work






Not enough natural light or air, lots of people hang out here. Lack of natural light, fluorescent lights




Poor lack of space, disuse



Implement plants or other natural features since lots of students study here (left)

Poor lack of space, disuse

Place-Based Relationships: Positive

Column 1: Natural drainage, cultural mural, Many people eat and study in this café area.

Column 2: Biking and pedestrian friendly, tiles reflect history and people, Watershed building integrates lots of connections between humans and nature.

Column 3: Aromatic plants, colors of adobe on building, mural representing local ecology

Column 4: Hung images reflect culture, area is used often by students enjoying or studying outdoors, Mural reflecting agriculture and culture

Place-Based Relationships: Positive



Historic, reclaimed wood, murals reflecting ecology, building encompasses military history




Native American mural shows connection to nature and Ohlone Costanoan Esselen people, murals depict agricultural connections, culture in exterior and interior spaces



Pathway enclosed with plants, Plants in median represent different cultures, otters

Place-Based Relationships: Needs More Work



Land that could be used in better ways.

Building dull, lacks interest

Hidden in the woods, lots of litter. Should be removed.

Evolved Human-Nature Relationships: Positive



Places that support people outside, with positive natural features—prospect and refuge, car-free zone (protecting environment), log seat, enclosed benches



Encourage people to bike, safe places for bikes, people promoting the protection of animals, beneficially controlling nature through gabion structures




Ice plant bad, mural good; curiosity in the landscape, Sensory garden to integrate nature and different senses of humans, nature/building transition, animal art with recycled tractor parts.

Evolved Human-Nature Relationships: Positive

Eating and studying in nature, natural medians

Controlling nature in a beneficial way

Opportunities to recycle, large bins for sorting

Evolved Human-Nature Relationships: Needs More Work




Need more wildlife cases like this around campus, lack of wildlife friendly trash cans (raccoons), litter



Lack of beauty, attraction

Lack of attraction, exploration




Broken desks in nature, planters in disuse, plain wall could have mural, raccoons in trash (we hope)

Evolved Human-Nature Relationships: Needs More Work

Social trails, degrading nature

Light and air pollution

Road looks ugly, lack of attraction

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