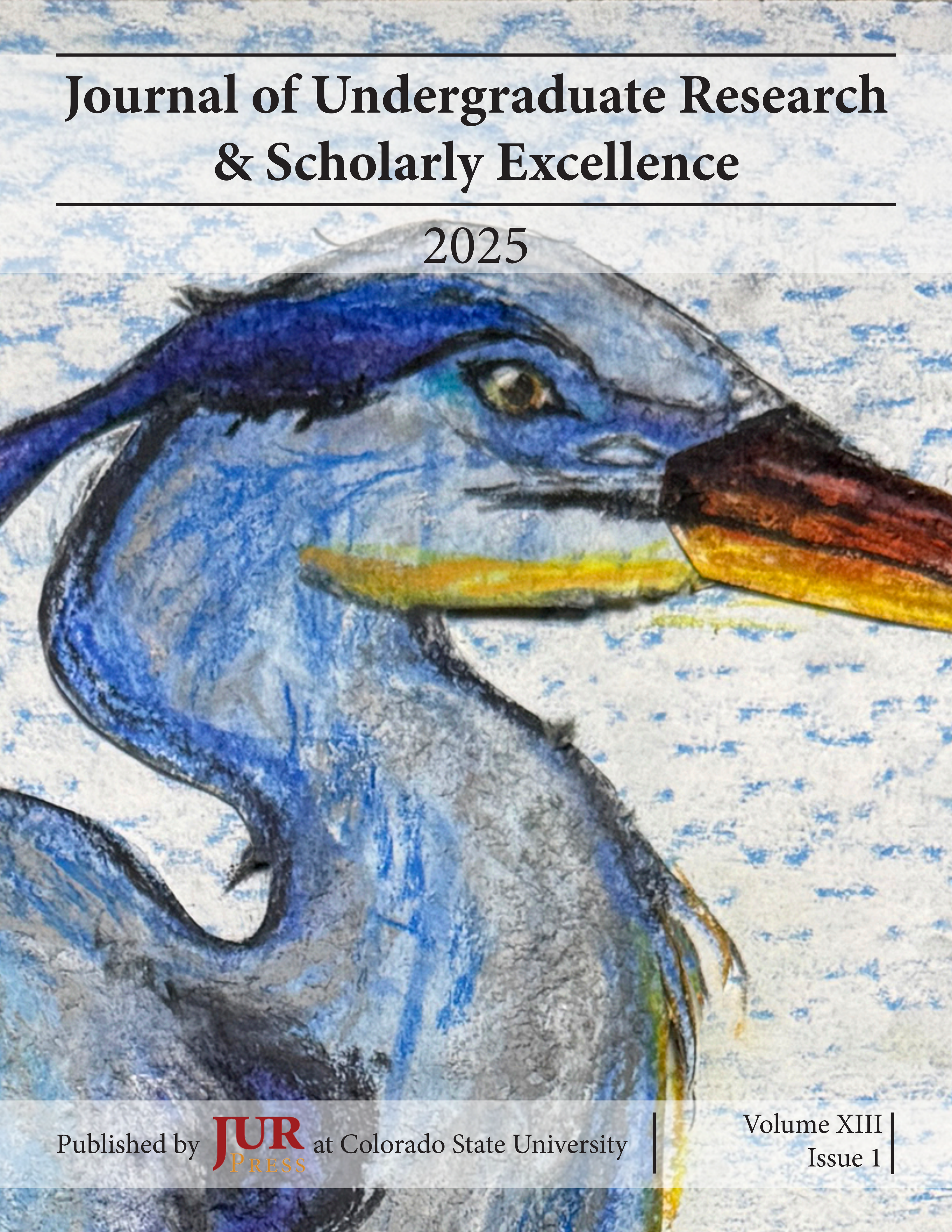
Journal of Undergraduate Research & Scholarly Excellence

2025



Published by JUR Press at Colorado State University

Volume XIII
Issue 1

JUR
PRESS

Journal of Undergraduate Research and Scholarly Excellence

JUR Press
Office for Undergraduate Research and Artistry
The Institute for Learning and Teaching
Colorado State University
801 Oval Drive, Suite 140
Fort Collins, CO, 80523-1052
Fax: (970)-491-3483

Designer: *Sophie Kiehl*
Cover Art: *Penelope Bussard*

ISSN: 2156-5309

Printed in the United States of America

Author Inquiries: For inquiries relating to the submission of articles please visit *http://jurpress.org.*

A letter from the editor

JUR Press is proud to present Volume XIII of the Journal of Undergraduate Research and Scholarly Excellence. This volume showcases outstanding interdisciplinary works completed by undergraduates from around the world, each carefully edited and peer-reviewed to uphold the academic rigor and excellence we value.

We are a journal for undergraduate and by undergraduates. Our slogan – linking the global undergraduate community – captures our mission of connecting and elevating the voices of worldwide undergraduate thinkers, experimenters, writers, and artists. Our goal is to not only provide an accessible platform for students to publish and showcase their work but to also give students the opportunity to learn about the intricacies of the publication process.

As Co-Editor in Chief, I am honored to continue the legacy of excellence that defines JUR Press. This volume was crafted to exemplify this legacy through the thoughtfulness and novelty of its published research.

Publishing this volume was not without its challenges. This semester, we received a record number of submissions, emails, and inquiries. With these new demands, our editorial team expanded, and I am proud of how every member uniquely contributed to the collaboration and community we prize in our editorial staff.

For all we have accomplished this year, I want to congratulate each team member. You are exceptional individuals with a wide range of talents, and I am grateful for you and your dedication.

Finally, I would like to honor our published authors. Each of you are leaders of research in your fields, and I am inspired by your work and creativity. Thank you for choosing JUR Press to be a part of your academic journey, and I look forward to continuing to link the global community with you.

Congratulations on this remarkable accomplishment, and welcome to Volume XII of the Journal of Undergraduate Research and Scholarly Excellence.

With appreciation,

Sophie Kiehl
Co-Editor in Chief 2024-2025
Journal of Undergraduate Research and Scholarly Excellence

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Questioning environmental education at CSU: Expanding environmental possibilities through ethnic and queer studies

By Grace Bolesta and Lindsey Schneider, Ph.D.
Colorado State University

Introduction

As the climate changes rapidly and environmental destruction becomes commonplace, the pressure to mitigate climate change intensifies. Though Colorado State University (CSU) prides itself on extensive environmental education and has accumulated many accolades, current systems of oppression are maintained through limited education. The discourse presented shrinks imaginable possibilities in understanding and addressing environmental harms and injustices and fails to contend with settler colonialism, capitalism, and neoliberalism. By using queer and ethnic studies, the possibilities of environmental education at CSU expands to incorporate a more accurate understanding of the environment we inhabit. Both disciplines offer knowledge and methodologies that address the root causes of environmental issues. Environmental education refers to forms of education focusing on understanding ecosystems and environments as they relate to climate change and other environmental injustices or harms, as well as CSU's larger environmental efforts. While there are significant critiques to be made in environmental STEM courses, this research primarily engages with humanities courses and university practices relating to environmental education. This research is validated as an auto-ethnographic account as a student engaged in coursework in environmental policy and economics, natural resources, global environmental sustainability, queer, and ethnic studies and is corroborated through other CSU students' experiences. I intentionally leave courses vague because while faculty are responsible for their syllabi, this is a system wide issue with vast applications. I come to this research as a student and recognize my interventions and critiques are not new and are compromised by my white identity. The purpose of this research is to synthesize and contextualize my experience as a CSU student as relating to environmental education. The first half of this essay is focused on critiquing my experience with environmental education and practices at CSU, while the second half I utilize the scholarship of ethnic and queer studies to suggest alternative possibilities. First, I consider the ways in which environmental education at CSU reproduces and maintains hierarchies of knowledge. Then I question the discourse surrounding the solutions presented in addressing current environmental harms. Next, I challenge the naturalization of these hierarchies and the solutions that sustain them. I then transition into asserting how queer and ethnic studies strengthen environmental knowledge and conclude by offering solutions beyond the current system. While Colorado State University claims to have extensive environmental education, the education presented limits the scope of possibilities of addressing environmental issues; instead, CSU would benefit from expanding the breadth of its inquiry through a critical queer and ethnic studies lens.

Questioning solutions

Though many solutions have been presented through environmental education, many continue to uphold Western hegemonic structures and thereby reify the issues they claim to solve.[1] Through the Morrill Act of 1862, federal law and policy legalizes and legitimates stealing land as an integral function of the US government for the creation of land-grant institutions like CSU.[2] Because settler colonialism is a structure and not an event, settler colonialism is still present in the function of universities through occupying land and producing Western systems of knowledge.[2,3] Settler colonialism, and its offshoot neo-colonialism, constructs land and the environment as a "resource" to be extracted and conquered through the "elimination of the Native".[3] The system of chattel enslavement and anti-Blackness also cannot be separated from the origins of Western dominant understandings of the environment and the creation of the idea of resources.[4] Enslavement dehumanized Black people in the US and attempted to make enslaved people a resource and property.[4] Racism devalues both people and land to create the grounds for colonialism, enslavement, and exploitation which still populate the world today.[4] Education at CSU fails to reckon with settler colonialism and anti-Blackness and its present reality; leading some to believe that settler colonialism and anti-Blackness are safe in the past, without calls for accountability. Environmental education cannot ignore this reality. By not grappling with colonialism in universities, students and faculty alike risk becoming extensions of it.

Through the questions asked in environmental curriculum, the maintenance of capitalism, colonialism, and neoliberalism are naturalized. Currently, learning at CSU stratifies knowledge and inscribes values into environmental studies which in turn, reinforces hierarchies of knowledge, privileging Western frameworks of knowledge. In doing so, students fail to receive the necessary tools needed to address pressing environmental issues and therefore limits the scope of addressing pressing environmental concerns. CSU courses, in my experience, posit instead a white, Western understanding of the environment in which discourse is limited to the reproduction of cis-heteropatriarchy, whiteness, and capitalism. Neoliberal institutions like universities are invested in maintaining capitalist business-like practices. They behave much like corporations as a "knowledge economy" that seek to develop "new performative measures to enhance output and to establish and achieve targets" for both political and economic gains.[5] Without a critical framework, students are offered neoliberal performative environmental solutions that I discuss in further detail later.

Technology

While the promotion of technology is appealing, it fails to consider the systemic cause of environmental harms. With the maintenance of global capitalism made possible through centuries of ongoing colonialism and imperialism, Western universities can access large swaths of land, minerals and materials for the creation of new technology. These resources are extracted to fuel "renewable" energy for campuses like CSU but ignore the ways in which access to these so-called resources are made possible through land theft and exploitation.[4,17] For example, lithium batteries often needed to power solar panels require extraction typically on sovereign Indigenous land across the continents of Africa, Asia, and South America furthering extractive colonial practices.[7,8] Yet in each of my environmentally focused courses, (excluding courses in ethnic studies), solar panels are promoted with little or no discussion of their consequences. This matters because it reifies technological "solutions" at the expense of vulnerable, colonized populations and communities. CSU publicizes its' new technologies and certifications, like the LEED certification, but LEED privileges wealthy institutions and does not account for the creation of these products or their detrimental impacts.[10] New buildings receive higher ratings encouraging new technology while ignoring how updating older buildings may overall be more "sustainable".[9] Sustainability is not inherently positive and can sustain exploitation instead. In essence, the people who make "sustainable" technologies possible do not reap the benefits of the technologies touted as clean.[11,12] Minerals required for so-called sustainable technology are creating "sacrifice zones" out of devalued lands and lives.[4] Focusing only on net zero emissions still is counter-productive because it merely shifts responsibility from wealthy nations and actors while poor countries and actors absorb the off-shored production.[11] This discourse leads students to only focus on the finished product rather than the systems and structures that create environmental degradation. This creates a schism between students at CSU and the lives of people, the more-than-human, and land that make their research and technologies possible both in Colorado and around the world. Technology is a means of entering new commodities into the capitalist market system and students are asked to buy in.

The advancement of "sustainable technology" is intertwined with militarism in the university. Despite the US military currently being the largest global polluter in the world, CSU offers a graduate certificate and coursework in "Sustainable Military Land Management".[6,7] Through the guise of sustainability, CSU boosts military technological development that promotes the occupation, degradation, and exploitation of land. These programs are disguised as the positive promotion of sustainable development; however, CSU remains invested in the destruction and occupation of environments. As students walk throughout campus, peace corps recruitment can be found on posters and tables. Though touted as a positive service-oriented experience, the peace corps is a tool of US imperial expansion to spread American values.[14] Both sustainable military studies and the peace corps operate in similar ways as options for students at CSU to participate in American imperialism under the guise of sustainability. In this way, CSU's environmental education does not live out their promoted principles of social justice.[15]

Individualism

Individual action is offered for a collective issue, and therefore environmental education at CSU fails to facilitate discourse that leads to substantive collective and coalitional work. Teaching students to solve environmental issues through individual action reproduces systematic failures because environments are inherently collective. Systematic failures cannot be remedied through individual policies. For example, in some political science courses students compete in a program called Shift Fort Collins that measures individual action for mitigating climate change. While individual action is not worthless and can inspire hope for bigger changes, it does not break the cycle of capitalism and other systems of actively creating ecological collapse. Instead, it trains students into individualized understandings of action. Shift Fort Collins assigns points to different actions including buying new energy efficient light bulbs, creating a greywater system, and reducing pollution from commuting by working from home.[16] Many of these individual actions are only accessible to people with enough class privilege to purchase new light bulbs, have the time to create a greywater system, or have employment that allows them to work from home. Many students, like me, work service industry jobs that require their physical presence. Additionally, our jobs do not pay well and are unable to contribute to other action items that require a purchase or extended time. Education is limited to individual action that renders students without access to certain resources as unproductive. This also conditions students to believe climate change can be solved through further consumption. Individuals are encouraged to compete against one another and those with class privilege are advantaged in classroom experiences. Class privilege then becomes centered in the classroom, and the correlation between wealth, resource use, and exploitation is lost. Courses may teach about the importance of working together or even coalition building, but in practice, most classes privilege Western individualism that does not facilitate the spaces necessary to create collaboration or coalition because individual academic performance is prioritized. As a neoliberal institution, the university prioritizes individual and performative change while power and responsibility are evaded.[5] Individualism not only isolates students from each other, but also valuable forms of learning outside Western thought upholding neoliberal institutional values.

Resources

Instead of a living entity, CSU courses treat the land as capital and a resource. Strictly seeing "the land" or "the environment" as a utilitarian resource is emblematic of the distortion of capitalism.[17] There has yet to be an iteration of capitalism in which exploitation does not exist.[18] In environmental economics courses at CSU, students are asked to find the value of a mangrove or other species.[19] In this process, mangroves are stripped of their inherent value and animacy and given a monetary numerical value as "settler colonial utilities".[20] The animacy and relationality of ecosystems are lost, and species values are reliant on their ever-changing utility to aid human consumption. However, ecosystems do not exist in isolation, and only valuing a species for their economic value is dangerous for ecosystems as a whole. This framing also allows students to believe we have authority in discerning environments that we are not a part of, often recreating settler colonial or imperial practices.[20] Scholars have argued that through the process of settler colonialism and racial capitalism, land is racialized and gendered, giving permission for its conquest through Western science.[4,21] When students in environmental economics courses are tasked with valuing species over each other and investing only in capitalist market based solution, it appears to be the only option.[19] In fact, in an upper division environmental course, a professor claimed proudly of being a capitalist and asserted it was the best solution for combating climate change. Limiting the discursive framing recreates the conditions in which capitalist resource ideas became the dominant framework to relate to the environment and students are left without alternatives.

Decentering Whiteness

Environmental education at CSU predominantly operates through the logic of creating both a "pure" (white) gene pool as well as a pure nature emblematic of eugenic thought.[9,22] One upper-division environmental course asked students to consider how COVID-19 aids in mitigating climate change.[23] In this framing, the death of millions of people, primarily Black, Indigenous, people of color, people with disabilities, and people living in poverty, is debated and celebrated for the sake of creating a "purer" environment. White bodies and Western conceptions of environmentalism are valued, while non-white people and practices are considered disposable and roadblocks to a sustainable future.[24,25] In this way, humans, the environments we inhabit, and the more-than-human become racialized and queered based on their ability to conform to Western norms of existence. Managing "sexuality, parenting, and morality [is] at the heart of the colonial project".[26] The naturalization of white heteronuclear reproduction transfers to ecological understandings limiting the scope of reproduction and ignoring the prevalence of queerness in all life forms. Humans and the more-than-human that do not fall into white heteronuclear reproductive norms are not only deemed unnatural, but toxic to the environment and in need of purifying.[25] The overpopulation myth is used to control non-white and non-heteronuclear forms of reproduction to "protect nature" yet continues to be a legitimized discussion in environmental coursework.[25] While there are legitimate concerns as to "resource" usage, people of color are problematized rather than capitalism, colonialism, and imperialism and communities are subjected to biopolitical practices in manifest destiny-esque appeals.[26,27] Courses at CSU focus on how Western education can inhibit population growth in the Global South while centering cis-heteronuclear reproduction and familial formations.[23] Or how bringing Western education to women in the Global South will slow "overpopulation". However, these approaches fail to understand the ways in which Western education can be a tool of settler colonialism and imperial expansion.[17] Environmental education at CSU must intentionally combat this in its process of reckoning with its settler colonial function. These solutions merely seek to address the symptoms of environmental harms, rather than the cause.

A queer and ethnic studies intervention

Because environmental education at CSU fails to ask questions that address the root problem, queer and ethnic studies generate possibilities beyond current systems. Ethnic and queer studies offer lenses to critically question the naturalization of current environmental education at CSU and the university at large. Ethnic studies is a discipline devoted to the interdisciplinary study of how race and ethnicity operate through systems of power. Queer studies is a field of study focusing on the ways in which sexuality and gender map onto bodies, society, and systems.[28] Both disciplines enrich environmental education by challenging the naturalization and presence of oppressive systems.[29] The quality of environmental education erodes when understood through critical engagement with ethnic and queer studies. Instead of collapsing the extent of environmental harms into capitalist solutions or individual action, ethnic and queer studies question the root causes of environmental harms and injustices. Since much of the education at CSU focuses on addressing environmental issues, it is important to accurately present issues to prepare students for post-graduation work. Ethnic and queer studies ask questions like, "who benefits from de-animating, purifying, and individualizing environmental issues? And what systems are invested in maintaining environmental destruction?" Discourse holds the potential for leading to liberatory action, but first students must understand the pervasive nature of systems of power. While CSU has an environmental justice center and some courses in environmental justice, they are limited and not incorporated widely.[30] Environmental education at CSU must reckon with environmental racism and other injustices, not just building solutions that maintain current order; and ethnic and queer studies helps environmental education do this. Climate change and other forms of environmental destruction cannot be fully addressed without being understood as forms of injustice. However, because the university is a neoliberal institution, efforts can easily become co-opted, therefore efforts must be deliberate and intentional.

Denaturalizing the environment through ethnic studies

Nature and the environment continue to ground a sense of false normativity and truth through education. Biological determinism, the idea that biological factors determine capability and behavior, has been used to justify enslavement, racism, cis-heteropatriarchy, and ableism.[29,36] Though often thought of as situated in the past, these justifications still populate environmental education and infiltrate the discourse surrounding it.[29] Through this social construction of naturality, environmental education reflects an assumed neutrality of the environment. Ethnic and queer studies draw attention to who has access to "nature", how it is managed, and how it is constructed. For example, in one political science course, students were prompted with an essay question, "do people in developing countries such as China have an inherent right to the same living standards as those in the developed world?" regarding environmental policy. This question implies that potentially people in countries like China may not have an inherent right to safe living conditions associated with capitalist nations.[32] Building off new materialist scholarship that understands environments to be both materially and socially constructed, ethnic and queer studies illuminates how environments and land become manufactured as deserving of life or not. Environmental toxins are naturalized as present in certain spaces and not others through their associated meaning not just physical matter. For example, Chen claims people assume lead "should"' be in China, but not *here* in white middle class homes making it permissible for environmental solutions to include lowering pollution rates by offshoring e-waste to China.[33] Blame is then assigned to the "other" through racial and nationalist appeals alleviating responsibility from Western consumption promoted in university learning privileges whiteness.[33] Whiteness is not just physical whiteness, but a phenomenology that orients how the world is understood.[34] It infiltrates norms of race, gender, ability, knowledge, progress, and environments, upholding colonial, capitalist, and neoliberal systems of power.[34] Without grappling with an assumed naturality of environments, problematic practices are inadvertently reproduced; ethnic studies help illuminate assumed naturality.

Natural resources organize around the creation of a hierarchy of life, in which humans can be deemed as a resource through racialization and dehumanization. Humans and the more-than-human are inscribed with societal constructions inscribed within a set of hierarchies through centuries of colonialism and racial capitalism.[35] The more-than-human are shaped by political, economic, and cultural forces through association that either animate or de-animate existences as more or less worthy of care.[36] Humans and the more-than-human exist in plurality as networks of beings each dependent on one another.[35] Ethnic studies helps connect environmental injustices to specific structures and systems that illuminate the slow violence of environmental harms.[11] Instead of natural resource discourse that de-animates the more-than-human and our surroundings, traditional ecological knowledge offers a means of restoring relationality.[35] Because of CSU's land-grant origins and place, this cannot be done without restoring Indigenous sovereignty. Indigenous sovereignty is not oppositional to environmental work, rather, Indigenous sovereignty is imperative for a livable and just future. Land is better managed by Indigenous peoples.[35,37] While the university is starting to incorporate Indigenous knowledges, it often tokenizes and flattens the diversity of thought between tribes and nations leaving impressionable non-Native students with incomplete understandings. Indigenous knowledges cannot be shrunk into a "discipline in the Western academy," and instead students' understandings should be pushed to question the existence of the settler state and therefore university's existence as well.[35,37] Following Nishnaabeg scholar Leanne Betasamosake Simpson, students should question in their classes, "do I have consent to take this intellectual thought and labor from a community I am not a part of? Does this engagement replicate anti-Blackness? Colonialism? Heteropatriarchy? Transphobia?"[37] Knowledge does not just exist for the betterment of white people.

Expanding ecologies with queer studies

Queer ecologies, an interdisciplinary field of study, challenges the naturality of environmental education at CSU. Queer, in this context, is animate or inanimate beings that disrupt prevailing heterosexist understandings of sexuality, gender, nature, or relationality.[36,38] Though beings may not self-identify as queer, they can be understood as queer purely because they disrupt human notions of what should and should not be, and what is natural and unnatural – all queerness is formed out of social construction yet embodies realized implications. Queer ecologies resist singularity and diminishing reproduction to cis-heterosexual reproduction inscribed in Western and colonial thought.[39] Since queer by this definition is whatever is against the norm, the "environment" itself is queer because it fails to conform to the social construction of its existence. Queerness is about the "vastness of being-with" that could include the more-than-human and all other forms of being.[40] Queer ecologies disrupts ideas of individualistic ideas of discrete categories of being by understanding the relationality between all life (animate or inanimate) because it understands how even our bodies are complex ecosystems home to many forms of queer(ed) reproduction.[41,42] Environmental education at CSU must contend with inherent queerness of ecologies that de-naturalize the precedence of capitalism and colonialism in environmental knowledge.[43]

Queer ecologies are not about returning to a linear time that homogenizes the past into a "pure" utopian world but creating outlandish possibilities for existence that do not predicate value on its adherence to purity or "naturalness". For example, bacteria and fungi weave together and compose the living and the supposed non-living and affirm a "pluralism of being and worlds".[40] They can be understood as queer in the ways they complicate understandings of individuality, family formations, binaries, reproduction, sex, etc.[39,40] Some fungi require disturbance and neglect not replicable or scalable for capitalist production, and in this way complicate ideas of labor.[39,44] Because fungi reproduction proliferates beyond cis-hetero-monogamy, it disrupts its ability to become exploitable through normative reproduction. Gender and sexuality are used as categories of control, expanding definitions of life and reproduction also challenge systems of control. Like fungi, humans also "respond to the intensity of capital investment and state control" by dying.[39] Queerness is generative, not just in physical reproduction or sex, but in its expansiveness and ability to disrupt hierarchies and queerness is everywhere. At CSU, incorporating queer ecology might look like incorporating the expansive relationality of all beings without hierarchies.

(Re)animating Environments

As contamination becomes commonplace, it also becomes a tool to play into racist fears and prejudice. Issues like soil erosion could be better understood as a symptom of settler colonialism and the advent of private property for for-profit capitalist agriculture.[45] Ethnic studies helps students orient ecological issues as part of larger structures. Some land is deemed as "wasteland" in relation to its ability to produce capital.[46] In the rhetoric of deeming certain areas as "barren", places are forced to take up the byproduct waste of capitalist and (neo)colonial accumulation. For example, the uranium industry deemed the Navajo Nation's land as a wasteland to hold extract material and release bio contaminants resulting in long term effects.[46] Despite deserts being high in biodiversity and having sustained populations globally in time immemorial, colonial and capitalist understandings of the environment rely upon manufacturing sacrificial land.[45,46] In this way, environmental extraction works in tandem with settler colonialism to dispossess Indigenous land through de-animating both land and people. Current frameworks in CSU classrooms focus on market-based solutions when understanding degradation like soil erosion, but instead capitalism and colonialism are actually sustained.

Members of scientific research, students and faculty alike, must be intentional in not furthering injustices for the sake of "saving the environment", though the university structure is primarily responsible for this labor. Seeing life everywhere shifts approaches to addressing the root of environmental injustice, not just symptoms. The more-than-human is not just acted upon, but also productive, generative, and life giving in and of itself.[29] Understanding the animacy of nonhumans and inhumanisms further complicates confronting settler colonialism. The life vs. not life binary is constructed as another form of colonial binaries rooted in Western settler Christian thought that enable hierarchies to emerge and thus control.[35] Reducing animacy to what is knowable by Western science allows resource discourse to emerge because the world is then composed of potential-capital rather than emerging relations. The term "natural resources" strips beings (human and non-human alike) of their agency for the "betterment of white people".[40] In my environmental coursework at CSU, land and place are either rendered as a natural resource for extraction, preservation through notions of "wilderness", or national parks. CSU continues to promote natural resource discourse and national parks as viable tools for climate mitigation. Neither engage with the animacy of place and the more-than-human, while both work as tools for Indigenous erasure.

Growing beyond the system

Abolition ecologies

Following abolitionist thinkers who posit that justice for police and prison violence is creating a system in which that never happens again, strategizing for environmental justice intend to not only mitigate harm, but instead dismantle the system that has created the problem. Abolition seeks to eradicate prisons, police, and the larger carceral system through addressing the root causes of harm and transforming it; abolition is not about the absence of police or prisons, but rather the presence of life-affirming institutions.[47,48] Environmental education at CSU cannot be separated from the place it embodies. Building upon the work of abolition ecology, environmental education must attend to the ways "that nature has always been unevenly socially produced through relations of empire, settler colonialism and racial capitalism".[49] Abolition ecology is defined as "deliberate organizing and continued theorizing against and about the continued existence of white supremacist logics that continue to produce uneven racial development within land and property relations".[49] This work demands moving beyond the human or nonhuman binary of relationality and bringing abolitionist practices into ecological and environmental knowledge. Neoliberal values in relation to environmental education allow for hegemonic forces to remain while discourse may change. If the university is understood as a center neoliberal education, disrupting its logic must be intentional. If not, how can we (members of the university community) expect ourselves not to become an extension of neoliberalism? If CSU is serious about leading in environmental education, it must ask questions in the classroom that lead students to ask, how am I implicated into this place? Am I working towards liberation or maintaining inequality? Abolition ecology challenges us to affirm life in efforts to rehabilitate the environment. This necessitates giving attention to what is life-giving and building "liberated life-ways" rather than capitalist interventions that require exploitation.[48]

Futurisms

Environmental education at CSU limits the possibility of world building in the age of ecological apocalypse through naturalizing the existence of environmental harm. Despite environmental apocalypse currently entering mainstream Western consciousness, the apocalypse is already here for many people. Currently, education at CSU indulges in doomsday ideology. Instead, an ethnic studies lens asks, whose world is ending? And how can the apocalypse be generative? Because current courses only focus on the problem with a limited set of solutions, students are not given the tools to imagine solutions beyond neoliberal interventions. Engaging in futurisms allows students to imagine outside the current reality. For example, Queer Indigenous studies offers a generative view of environmental collapse through expanding the boundaries of life. Works like *Love After the End* demonstrate possibilities of generative apocalypses in that the ending of the current world, one molded in injustice, a better new world is given room to grow.[50] This anthology of Indigiqueer and Two-Spirit speculative fiction offers a means of building imaginations outside the settler state. Ethnic studies' coursework engages with materials like this to ask, what would a world look like without whiteness? Who benefits from a cynical world view? Generating life, in these stories, does not fit into heteronuclear means of (re) production, but rather, creates and affirms life through an inseparable relation between queerness and Indigeneity. Imagining worlds without cis heteropatriarchy, whiteness, and capitalism, are vital to environmental education, not because simply they offer hope, but because Indigenous resurgence is necessary in and of itself.[37] Only offering students doomsday models of the future due to environmental collapse encourages defeatism that strengthens systems of power. Environmental education would benefit from a cross-discipline approach that offers alternative ways of thinking. Hope is not naïve, but it does require action.

Strategizing change

Ethnic and queer studies should not be taught simply for the benefit of white students or to fulfill neoliberal multiculturalism. The implicit nature in environmental education at CSU is the preservation of whiteness. Neoliberal diversity efforts tokenize Black, Indigenous, and people of color's knowledges and epistemologies in the name of multiculturalism and often place people in unsafe environments.[2] Non-Western epistemologies are valued in their ability to aid the preservation of white worlding.[1] Environmental education prioritizes the survival and flourishing of whiteness and instead must prioritize genuine participation from communities most affected by environmental changes allowing for self-determination and sovereignty. Without understanding systems of power, systems operate both on and through us. Changing environmental education requires moving beyond neoliberal taskforces or "diversity requirements".[5] Ethnic and queer studies have potential to encourage critical thinking, leading students away from capitalist solutions into critical interventions that address root causes of environmental harms. However, these disciplines are also implicated in the university structure and should not be exempt from critical analysis. Without meaningful participation in research and critical relationality with people, the more-than-human, and environments, we risk recreating imperial and colonial "subjects" in research. Additionally, an analysis of labor is also critical so that racial capitalist labor structures are not reproduced.[51] Change requires a deliberate decentering of whiteness and cultures of white supremacy that promote exploitation on university campuses.[52] The content of education should also match educational models that intend to disrupt systems of oppression, and must also delegitimize the presence of capitalist and colonial work ethics and pedagogies. Students should not bear the burden of educating faculty, particularly when faculty do not hold the same identities.

Though abolition cannot happen overnight, changes in the university should work to erode the power the university holds as a settler colonial, capitalist, neoliberal institution instead of giving it more power. Because ethnic and queer studies grounded in liberation is antithetical to the university's function, incorporating these disciplines utilizes the structure of the university to challenge its existence. Following la paperson's work in "The Third University", assemblages within the university serve as avenues for decolonizing the university. However, to fully decolonize the university, it will cease to exist.[2] Utilizing the tools the university already has, members of the CSU community can strategize for the potential of liberatory futures. Delegitimizing the presence of the settler state, and by extension universities, members of the university community strategize against its imposing existence. For example, the university structure operates through scarcity in securing knowledge behind a tuition paywall. However, with access to the materials as a university student or faculty member, we can disseminate knowledge and deconstruct its manufactured scarcity and promote abundance. The goal should not be to change the system from the inside which almost always changes the individual, rather, assemblages do not seek reform but move towards a more liberatory future. La paperson also recognizes how members of the university are "creatures of colonial desire", despite seeking decolonial and unsettling futures.[2] Systems of colonialism, capitalism, and neoliberalism are not accidental, they are intentional means of creating control and order, therefore its abolition must also be intentional. As a land-grant institution, explicitly founded on disposition of Arapaho, Cheyenne, and Ute land, CSU has an obligation to move beyond land acknowledgements and return land. This cannot occur without genuine engagement with Indigenous nations and peoples. Empowerment is not just about recognizing disenfranchised communities, but a process grounded in materiality. If we understand the pervasive nature of systems of oppression, we are all implicated in remediating them.

Conclusion

As environmental education becomes integrated into university curriculums, ethnic and queer studies can guide environmental education beyond reifying capitalist and neoliberal solutions that uphold settler colonialism. Current solutions like technologies create "sustainable" solutions as something that can be bought and consumed. Similarly, treating land as a resource furthers settler colonial logics instead of understanding how settler colonialism destroys "the environment" intentionally for its ongoing project. Constructing action purely as an individual fails to address the collective nature of environments. Therefore, ethnic and queer studies serves to more accurately understand environmental education as an entity that is inscribed with racism, cis-heteropatriarchy, ableism, etc. This research is far from complete, and future directions should further engage with race and animality, settler colonialism and access to "nature," and the university as a neoliberal tool. Additionally, further work analyzing curriculum and university practices at large is needed. Grounding environmental education in liberatory traditions such as abolition helps prepare students for creating a livable future. While I focus on CSU, ultimately, I am concerned about environmental education because I am invested in creating a livable future. The purpose of this research is not to use queer and ethnic studies as tools to rehabilitate the university, but rather, to ultimately dissolve its power and in doing so create the conditions for life affirming futures.

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Poverty-related adversity and developmental neurophysiology

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Young children living in poverty represent an extremely vulnerable population, as they face the tolls of impoverished living during critical periods for development. During their first six years of life, children receive masses of new information about the world around them and their place in it. This time is key for laying the foundation for development of social skills, cognitive schemas, stress regulation pathways, coping strategies and habitual patterns of emotionality, among other aspects of the psyche.[1,2,3,4,5,6] Research among children under age six raises concerns for those living in poverty characterized by nutritional issues, negative parenting, exposure to violence, unstable education and a myriad of physiological outcomes later in life.[7,8,9] Physiology, in particular (e.g., cardiac electrophysiology, neural electrophysiology, neuroendocrinology), is the subject of a wealth of literature that connects poverty to leading and other major causes of death including cancer, cardiovascular disease, immune disorders, psychopathology and suicide.[9,10] Poverty and its effect on physiology is a dire stressor that can negatively impact critical developmental stages, during a time which should be safe for children to get acquainted with the world. Therefore, the relation between poverty and physiology is an avenue of research that needs to be explored with increasing rigor so that developmental psychology as a discipline and clinical practice, can contribute to healthy physiological development for this at-risk group.

Adversity and physiology in young children is implicated in numerous regulatory processes, often originating in the nervous system.[4] Dysregulation of neurophysiology in development can lead to adverse acute and long term neural states including atypical activation of the stress response, mood swings, deficits in cognition and disruptive behavioural patterns.[4,11] While such patterns are observed in adults, neural dysregulation in children poses a much greater threat to well-being due to the degree of experience-prompted neural specialization that occurs during this time, which is key to forming lifelong functional connections and activity patterns.[12,13,14] Experiencing poverty at this time likely has a strong influence on neural development and the pathways that develop during time have been shown to persist, even in the absence of adversity.[11,15,16,17] Clearly, the effect of poverty on neurophysiology represents a concerning set of developmental circumstances, in dire need of detailed attention from both scientists and practitioners.

In this paper, I review evidence of how poverty-related adversity is related to dysregulation of specific facets of neurophysiology in children from birth to six years of age. Poverty-related adversity, within the context of this review, is defined quite broadly to include various stressors and the diversity of socioeconomic status measures in research.[8,17,18] The elements of neurophysiology considered include cardiac electrophysiology as a function of autonomic nervous system (ANS) dysregulation, neural electrophysiology tied to cognition, and neuroendocrinology with consideration of the hypothalamic-pituitary-adrenal (HPA) axis stress response system. In review of these key fields, I consider them with respect to early neural development, and potential mechanisms for their underlying physiology. I also discuss possible buffers and mitigating effects for the influence of poverty-related adversity on development and put forth considerations for new, extensive research.

An introduction to cardiac electrophysiology, neural electrophysiology, and neuroendocrinology

Poverty-related adversity in children has been associated with an array of negative physiological outcomes, particularly how the heart is regulated by the ANS, brain activity with respect to cognition, and hormone regulation. While each outcome represents a specific facet of developmental neurophysiology, yielding its own findings, the three are quite connected in terms of the specific physiological pathways involved and how they are influenced by poverty, requiring consideration of their interrelation. Foremost, however, is a basic understanding of the physiological principles underlying electrophysiology of the brain and heart as well as the neuroendocrinology of the stress response.

Neural electrophysiologists study neural activity using a variety of methods, one of which is electroencephalography (EEG). EEG techniques provide precise measures of when changes in neural activity occur, down to the millisecond.[20] EEG is used to measure stimulus-dependent neural activity through changes in event-related potentials (ERPs), which reflect the sum of activation occurring in different parts of the brain in response to a stimulus.[20] Additionally, EEG is used to study neural activity in the absence of a stimulus or in a resting state. Part of electrophysiological research involves studying spectral power, which refers to the strength of brain activity within different ranges of brain wave frequencies.[21] Measures of spectral power within a frequency band at rest often reflect the strength of a neural activity pattern and the functions that the band is associated with.[21] To illustrate, if resting oscillations within a particular band are implicated in attentional processes, one can infer that increases or decreases in resting oscillations among different individuals are correlated with differences in attention span. Taken together with ERP studies that examine task-related differences in neural activity, EEG research can be used to assess various developmental trajectories of neural activity patterns common in children living in poverty.

Cardiac electrophysiologists study a wide variety of electrical phenomena of the heart, one of which includes vagal tone. Vagal tone refers to activity of the vagus nerve, a cranial nerve with a myriad of effects, the most important of which include heart rate reduction and vasodilation/constriction of blood vessels.[22] Respiratory sinus arrhythmia (RSA) is considered a biomarker of vagal tone and can be used as an index of vagal tone in research.[22] RSA is a decrease in the variability between heart beats upon inspiration and an increase during expiration. Hence, RSA and heart-rate variability (HRV) are highly similar physiological measures and are commonly used interchangeably in research.[23] RSA is often measured using an electrocardiogram (ECG), which provides a visualization of the heart rate during breathing.[23] Higher RSA can indicate a faster cardiac recovery from stressful situations and represents adaptive physiological regulation.[22] This measure allows for scientists to quantify stress regulation as a result of ANS activity and this is especially useful in children due to its objective and noninvasive nature.

Neuroendocrinology is the study of how the nervous system influences hormone release and regulation. Hormone secretion is regulated by the hypothalamus, located at the base of the brain.[14] Of consideration, with respect to poverty's effect on physiology, is cortisol, often termed the stress hormone. The sympathetic nervous system enables mobilization of the body's resources to facilitate changes in breathing rate, blood pressure and other bodily responses to prepare an individual to handle a stressor through the 'fight or flight' response.[24] This response is made possible by the HPA axis, a network characterized by coordinated activity of the hypothalamus, pituitary gland and adrenal glands. Hypothalamic release of corticotropin releasing hormone (CRH) triggers the pituitary gland to release adrenocorticotropic hormone (ACTH) into the blood circulation.[24] ACTH stimulates the adrenal glands to release cortisol. Activity of the HPA axis is highly adaptive in dealing with acute stress. However, child stress in the context of poverty usually consists of prolonged stressors such as exposure to violence, malnutrition and social discrimination.[7,9] This pattern of exposure can lead to dysregulation of the HPA axis, which is linked to numerous negative outcomes within different facets of physiology, and to a myriad of problems with behaviour and mental health.[9,25,26,27] Evidently, neurophysiology in children is quite complex, and the methods of study within these subfields are even more so. However, it is critical to acknowledge and understand the interrelation of these subfields to develop a broad perspective on physiological outcomes as a result of poverty, allowing for both specific interpretation of relevant findings and simultaneous consideration of their wider implications.

Childhood poverty and cardiac electrophysiology RSA, and polyvagal theory

Measures of RSA are commonly used when studying stress physiology in children, particularly those living in poverty. Task-related RSA, also referred to as RSA reactivity, serves as a measure of ANS activity that quantifies how children regulate their physiological states in response to a stressor.[22] Decreased RSA, or RSA withdrawal has been associated with effective physiological regulation of emotional states in five-year-old children in response to sad film clips.[28] Relatedly, a study employing a similar paradigm demonstrates RSA augmentation, or increased RSA, as an indicator of effective emotion regulation in five to six-year-old children following presentation of sad or scary film clips.[29] Although there is some conflict in the literature as to whether RSA augmentation or withdrawal is linked to better emotion regulation, stronger evidence points to the latter, due to its consistency with polyvagal theory. Stephen Porges provides an account of this theory with reference to specific evolutionary processes that indicate control of the heart by the vagus nerve withdrawing its influence on heart rate.[73,74] The vagus nerve is constantly working to slow the heart rate and promote relaxation. Without the effects of the vagus nerve, as are seen in RSA withdrawal, heart rate is then able to increase naturally and prepare the body for action without full activation of the sympathetic nervous system, which occurs during the 'fight or flight' response. This, in turn, promotes effective emotion regulation via expression of sympathetic tone without activation of the sympathetic nervous system or adrenal system, both of which would require the body to expend increased energy and resources. Hence, RSA withdrawal in response to stress may be an adaptive means of emotion regulation, as opposed to increased RSA.

RSA reactivity in response to cognitive and socio-emotional stressors

While it is reasonable that RSA withdrawal is linked to better emotion regulation, the opposite pattern of cardiac physiology has also been observed in children exposed to poverty-related adversity. Ryan Giuliano and colleagues demonstrate that in response to an auditory selective attention task, RSA withdrawal is associated with lower levels of inhibitory control in three to five-year-old children at socioeconomic risk, indicating poor regulation.[42] Amanda Hampton Wray and colleagues show similar findings in a study of four-year-olds performing a dichotic listening task, demonstrating the effects of poverty-related adversity on cognitive performance.[44] Studies measuring RSA in response to cognitive tasks are important due to their educational implications, however, research examining RSA in response to socio-emotional stressors is increasingly relevant to assessing the impact of poverty on physiology. This is because stressors faced by children living in poverty are often socio-emotional in nature (e.g., exposure to violence, social discrimination, negative parenting). Therefore, studies using RSA measures in response to these stressors help to better understand and target socio-emotional development as related to physiology. For instance, Elisabeth Conradt and colleagues demonstrate that early caregiving stress in low SES children is associated with RSA augmentation in three-year-old children, suggesting that the vagus nerve remains active during times of stress, causing the body to opt for full sympathetic nervous system activation during times of stress.[75] This finding is replicated in research using the still-face paradigm (SFP) to simulate emotional stress in infants. In a 'still-face' episode, the infant's parent holds a neutral face and does not interact with the infant, representing the stressful event. Following this, there is a reunion phase in which the parent plays with the infant normally once again, representing relief from the stressor.[30] Studies employing this paradigm in children of low SES, often demonstrate RSA augmentation in the reunion stage, indicating deficits in regulating emotions induced by stress even after removal of the stressor.[30,31] Therefore, research using both cognitive and socio-emotional stressors demonstrates that poverty-related adversity can be associated with task-related RSA augmentation. This pattern of cardiac electrophysiology, when considered with reference to polyvagal theory, is likely a deviation from adaptive physiological activation patterns and, therefore, may be linked to a host of negative physiological outcomes.

Parental affect as a mediator of RSA in children from low SES families

Interestingly, in consideration of the findings outlined above, SES may have an impact on cardiac physiology. However, when studied in relation to other developmental variables, like parenting, the negative effects of poverty on cardiac physiology are somewhat mitigated. In earlier consideration of work employing the SFP, the reunion phase of the paradigm represents stress alleviation in response to parental interaction. However, in five month old low SES infants, RSA augmentation was observed during this phase, suggesting that parental interaction is not as effective at reducing stress in low SES infants when compared to high SES infants.[30,31] Therefore, parental affect, or the emotions parents display towards their children, may be a mediating factor for these findings. Research shows that positive parental affect and social support are associated with RSA withdrawal in five-year-old children, possibly indicating strong emotion regulation.[32,33] Furthermore, Megan Johnson and colleagues demonstrate that one-, three-, and five-year-old low SES children with a lower baseline RSA, show developmental increases in resting RSA when raised by highly responsive mothers, further demonstrating the link between parental affect and adaptive cardiac physiology.[33] Higher resting vagal tone has been associated with effective emotion regulation in preschool-aged children and toddlers.[34,35,36] Therefore, when considered with respect to previously discussed findings linking low SES and RSA augmentation, one can begin to consider attachment and parental affect as buffering factors for the relationship between poverty-related adversity and cardiac physiology. However, it is important to note that this relationship is not fully understood in the developmental research literature, and further research is needed to elucidate what task-related RSA withdrawal or augmentation means for developmental physiological regulation. Despite this limitation, it is evident that the experience of poverty-related adversity may be related to ANS regulation and that this relationship is potentially moderated parental support. While parental support is considered a possible protective factor for the negative effects of poverty on cardiac physiology, other protective factors may exist outside of the parent-child relationship that may have implications for healthy child development, representing a critical avenue for future research.

Child poverty and neural electrophysiology: event-related EEG, attention, and inhibitory control

EEG research related to neural activity of children living in poverty largely examines event-related potentials (ERPs) as related to cognitive performance.[18,37] An ERP reflects the simultaneous neural activity of different brain regions in response to a stimulus. Different neural subpopulations are recruited in response to different stimuli, and do so in particular patterns. Hence, changes in ERPs are categorized into different components. One component of interest in studies of developmental electrophysiology is a positive increase in wave amplitude/frequency that occurs between 100 and 300 milliseconds (ms) following a stimulus.[38] This component has been observed in three–five-year-old children and is thought to be related to early neural mechanisms in selective attention, with higher component amplitudes reflecting lower levels of selective attention.[38,39,40,42] This component is referred to in relevant literature as a positive ERP response. Studies measuring this component have demonstrated that children from low SES families display more positive ERP responses to distractor stimuli than high SES children, suggesting lower levels of selective attention.[42,43] Relatedly, three–six-year-old low SES children tend to display comparable ERP responses to both distractors and stimuli meant to be attended to, compared to high SES children who exhibit more positive ERP responses to attended stimuli rather than distractor stimuli.[44,45] Additionally, error-related negativity (ERN) is a downward peak in wave frequency observed after errors are made and is thought to be linked to inhibitory control and affected by poverty-related factors such as negative parenting and lower SES.[19,46,47] Furthermore, another ERP component often examined with SES is the P3b, which is a positive increase in wave frequency occurring 400 to 700 ms following a stimulus.[48] The P3b has been thought to be related to inhibition and attention allocation processes in four–five-year-old children.[48,49,50] Studies measuring this component usually employ a visual task in which children are instructed to press or not press a button when presented with certain images. Research using this task, coupled with measurement of the P3b demonstrates that low SES children display lower P3b amplitudes during this task and complete it with less accuracy compared to high SES children.[48,50] Research conducted on possible factors mitigating the effects of lower SES on P3b amplitudes suggests that proper nutrition and positive parent-child interactions may help to improve selective attention and inhibitory control in four–five-year-old children.[37,51] Additionally, findings by Elif Isbell and colleagues indicate that lower P3b amplitudes persist into adulthood for low SES children, further highlighting the importance of research on factors protecting against the effects of poverty-related adversity on developmental electrophysiology.[76] Experimental research on poverty-related adversity and changes in ERP components in children younger than six years of age is quite sparse. Continued research is necessary to identify and address gaps in literature and develop a more comprehensive understanding of how children's neural activity may be affected by poverty.

Resting theta waves

In addition to ERP studies that examine task-related neural activity, studies of resting state EEG also contribute to the understanding of children living in poverty's neural electrophysiology. As previously discussed, neural activity occurs in the brain as oscillations within different frequency bands, and higher measures of spectral power within a band at rest may represent an increase in the functions that band is associated with.[53] For instance, higher resting theta power has been correlated with reduced response inhibition.[53,54] A series of studies following two cohorts of children of higher and lower SES from18–30 months to five–six years of age, shows that low SES children have higher resting theta power.[55,56,57] Additionally, Przemyslaw Tomalski and colleagues found that lower frontal gamma power was observed in infants in lower incoming homes. Resting gamma power is thought to be associated with language skills in early childhood.[58] The summarized literature represents the small body of research measuring resting EEG in children younger than six years old of varying SES. Due to the limited nature of this research, it is difficult to draw strong conclusions about young children's resting electrophysiological profiles and how they are influenced by poverty. Therefore, the finding previously mentioned that higher resting theta power is observed in children of low SES and its relation to poor response inhibition, should be interpreted with caution. Rather than as evidence, this finding and its implications can be considered a starting point for future research to stem from. Building on this potential relationship would address the lack of research on resting EEG in young children and would serve to draw more conclusive evidence of how it may be affected by poverty-related adversity.

Selectivity filter development and homeostatic neural plasticity

Higher positive ERP responses and lower P3b amplitudes in children of low SES may be associated with lower selective attention and poor response inhibition compared to high SES children. This may occur because low and high SES children are likely to develop different patterns of tending to and ignoring stimuli in their specific rearing environments. Amedeo D'Angiulli and colleagues pose a specific mechanism by which this occurs.[77] Higher SES children potentially develop the ability to engage in early selection and filter out distractions in earlier stages of attentional/perceptual processes than children of lower SES who may develop late selection processes and filter out distracting/irrelevant stimuli at later stages. Relatedly, Steven Quartz and Terrence Sejnowski propose a selectionist-constructivist perspective to neural development in which children develop experience-dependent activity patterns based on the information-processing challenges they face most frequently.[78] For instance, low SES households can be characterized by neighborhood or domestic violence and crowding in the home. Having to deal with such stimuli in addition to, or in the place of normative developmental activities like play and reading, may alter a child's information processing pathways in that they filter out distractions later than normal. This perspective and potential mechanism is consistent with theories of homeostatic plasticity that propose neural firing as being regulated within functional, adaptive boundaries.[59] The differential selection mechanisms that develop, potentially due to varying SES, may represent firing patterns that are adaptive for a child's specific environment. In the cases of low SES environments with possibly multiple sources of input, engaging in early selection may disturb homeostasis and represent a firing pattern outside of the functional boundaries a child can maintain.[59] Hence, low SES children may engage in later selection to maintain neural homeostasis and perform poorly on tasks requiring selective attention and inhibition as a result.

Child poverty and neuroendocrinology hypercortisolism, hypocortisolism, and allostatic load

The sympathetic nervous system is responsible for the fight or flight response, a homeostatic process that regulates stress through cortisol secretion. This response is quite adaptive in the short term. However, continued activation of the HPA axis, as observed in children living in poverty, may lead to habituation of its effects, eventually resulting in a lower degree o activation during stressor exposure.[24] This reaction is termed *hypocortisolism*.[60] Contrarily, if the adversity is extreme, a child may experience frequent or prolonged HPA activation, referred to as hypercortisolism.[60,61] This dual pattern of HPA activation creates a discrepancy in developmental research in which studies report both high and low levels of cortisol in children experiencing poverty-related adversity.[8] Hypercortisolism and hypocortisolism can be considered as adaptations with respect to allostatic load theory. Allostatic load refers to the physiological costs associated with adaptations.[62] Developmental adaptations such as hyper and hypocortisolism enable an individual to physiologically regulate stress, while attempting to inflict the smallest possible allostatic load onto the individual.[62] However, in the case of poverty-related adversity, the best possible outcomes for children dealing with chronic stress may still pose a maladaptive set of physiological circumstances that threaten their immediate and lifelong health.[8] Under-activation of the HPA axis as a result of hypocortisolism puts children at great risk for immune dysfunction and has been linked to inflammatory and autoimmune disease.[63] Chronically elevated cortisol levels—as seen in hypercortisolism—are linked to negative outcomes including delays in cognitive maturation, childhood obesity and compromised immunity.[64,65] Hypercortisolism is the subject of a wealth of literature, and hypocortisolism has not been given the same attention.[63] Therefore, findings indicating reduced cortisol levels as a result of poverty-related adversity are discussed in this review.

Diurnal cortisol release

Neuroendocrinological research often quantifies stress levels using measures of salivary cortisol in the morning and evening. This is because cortisol release adheres to a circadian rhythm: this entails a peak upon waking and sharp decline in the hours following waking, and a more gradual decline into the evening.[24] The morning peak of cortisol is referred to as the cortisol awakening response (CAR) and is thought to occur in anticipation of daily physiological demands, the intensity of which are based on prior experience.[24] In children living in poverty, the normal rhythm of cortisol release and the CAR are disrupted. Research demonstrates that poverty-related adversity variables such as single parent status, lower income, economic instability and negative familial life events are linked to dysregulated activity of the HPA axis, indicated by lower levels of morning cortisol in three–six-year-old children.[60,66,67,68,69,70] Evidently, low SES and hypocortisolism—especially within the context of the CAR—are associated; this has implications for physiological development. Research relating to mitigating the effects of poverty-related adversity or protective factors is minimal and has primarily examined the effects of hyper rather than hypocortisolism. Findings indicate that greater playtime, greater sleep time, and positive parental affect may protect against HPA axis dysregulation as related to exposure to poverty and related stressors in three–six-year-old children.[71,72] Further research is needed to elucidate the processes by which poverty related adversity contributes to dysregulation of cortisol release in young children.

Vagal tone as a precursor to poverty-induced hypocortisolism

With respect to allostatic load theory, it has been proposed that hypocortisolism serves as an adaptation to adversities such as poverty, which comes at the cost of healthy immune function and possibly other aspects of physiology. Considering the interconnectivity of various facets physiology, research linking cardiac electrophysiology and cortisol secretion alludes to vagal tone as a potential mediator between poverty and hypocortisolism. Relating to Porges' polyvagal theory, the subdiaphragmatic vagus represents a key structure in the dorsal vagal complex, which is a physiological system theorized to be involved in the conservation of metabolic resources. Activation of the subdiaphragmatic vagus is thought to inhibit the HPA axis and therefore reduce cortisol secretion.[73] Based on this finding, one can begin to construct a directional mechanism for the influence of poverty on physiology. Specifically, because RSA augmentation is observed in low SES children, when considered with respect to Porges' finding, it can be inferred that poverty-related adversity is a major contributor to higher activity in the subdiaphragmatic vagus and that this, in turn, results in reduced cortisol levels in children. However, very little research has been done surrounding Porges' finding, none of which has been conducted with children exposed to poverty-related adversity.[73] Despite this, the outlined mechanism proposes directionality in how poverty affects children's physiology and further highlights the interconnectedness of various facets of developmental neurophysiology.

Conclusion and future directions

This review aims to create a comprehensive picture of how the experience of poverty-related adversity from birth to age six affects cardiac physiology, neural electrophysiology and neuroendocrinology. Key findings in each subdiscipline are considered. Broadly, regarding cardiac physiology, poverty is linked to task-related augmentation in RSA. This association implies that children living in poverty are slower to calm down following exposure to a stressor, which has negative implications for the cardiovascular and autonomic nervous systems and for disease-related outcomes later in life. In terms of neural electrophysiology, research depicts a potential association between poverty and patterns of neural activity implicated in lower selective attention, and poor inhibition in children. Finally, the impact of poverty on neuroendocrinological outcomes has been linked to both hyper and hypocortisolism, the latter of which may have potential links to cardiac physiology. While physiology is complex, one can argue that poverty-related adversity is more so; poverty is a multifaceted set of circumstances surrounding a lack of resources that impose unique challenges for child development, and combined with aspects of physiology these challenges are exponentially larger. Future research would benefit from studies elucidating the mechanisms by which RSA is affected by poverty-related adversity, which in turn would allow for the construction of developmental models of cardiac electrophysiology which could serve as potential benchmarks for the development of effective emotion regulation strategies. Similarly, more extensive EEG research is required among children facing povety-related adversity. This will help to create a profile of neural activity for children who do and do not face this type of adversity, allowing for more robust conclusions to be drawn regarding the educational implications of poverty-related adversity. Lastly, hypocortisolism as related to poverty-related adversity is an under researched phenomena. Future studies that would explore hypocortisolism in this context would be highly beneficial for developing models of cortisol release as a result of poverty-related adversity. This information would serve to inform literature and research relating to pediatric immunology and endocrinology, the former of which has become a high priority for developmental researchers and clinicians due to the COVID-19 pandemic. The subfields of study and specific neurophysiological mechanisms discussed in this review represent a starting point for future studies to expand upon. Birth to age six is characterized by a myriad of learning opportunities that shape behaviour and physiology, all of which are negatively impacted by a lack of resources. Developmental physiology, as a research discipline and clinical practice, is uniquely equipped to help children living in poverty and this research can be used to mitigate its adverse effects.

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Mapping suitable areas for marine recreational activities around Tutuila Island, American Samoa

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Abstract

The development of tourist destinations and the promotion of recreational activities should be based on identifying locations that can balance economic growth and environmental sustainability. In this study, we identified potential areas suitable for different human activities in the waters surrounding Tutuila Island, American Samoa using a species distribution modeling (SDM) approach. The information generated can be easily coupled with data on priority species distribution and similar factors. This research represents a new application of SDMs, as it quantifies the relationship between marine human activities and marine environmental characteristics, as opposed to species occurrences data and potential abiotic surrogates of their distribution. Bathymetric data were used to derive a set of terrain attributes (e.g., slope, seafloor rugosity) that were then combined in the software MaxEnt with spatially explicit data of human use of the coastal waters. MaxEnt uses a maximum entropy approach to establish relationships between the two sets of variables and to predict the probabilities of occurrence of the different human activities in unsampled areas based on seafloor characteristics. Our results show that the waters around Tutuila Island, including within the National Park of American Samoa, are suitable to host six human activities: gill netting, spearfishing, rod and reel fishing, surfing, SCUBA diving, and snorkeling. The strength of the relationships between human activities and environmental variables was quantified, enabling a better understanding of what drives people to use certain areas. The results indicate that people prefer shallow waters and more complex seafloor environments such as reefs to participate in marine recreational activities. This preference varied based on the type of activity, i.e., those involving swimming and those involving fishing. The results of our study provide a relatively simple and accessible tool to assist decision-making in the context of resource management that combines economic growth, ecotourism, and marine conservation.

Introduction

Designating areas as Marine Protected Areas (MPAs) is a popular approach to managing marine ecosystems that ensures their protection while still allowing for human use such as tourism or recreation.[1] Well-managed MPAs have been shown to provide sanctuary habitats for species that feed, live, and breed within them.[2,3] MPAs, while often restricted to the public for certain activities, are classified on a spectrum of allowed human uses. “No access areas” represent the most restrictive form of MPAs, in which no unauthorized human access is allowed. There are very few “no access” MPAs in the United States and its territories. From a socioeconomic perspective, these areas are of little interest because they offer only indirect economic benefits for proximal communities by way of fishery support.[4,5] Zoned multi-use MPAs with no-take areas and zoned multi-use MPAs are by far the most common forms of MPAs in the United States. These areas allow virtually all recreational and commercial practices but regiment them highly.[6] MPAs also provide a suite of economic services for nearby human communities, including tourism.[7] It has been suggested that while conservation and tourism interests are often at odds with each other, striking a balance between these two perspectives often best serves the community and economies at large.[8]

Small Islands Developing States experience economic vulnerabilities due to their remoteness, small size, limited exploitable natural resources, and susceptibility and exposure to natural disasters.[9] These impacts manifest in a poorly diversified economy that often relies on a specific industry. In American Samoa, the ocean economy, which includes the tuna canning industry, employs about 40% of the territory’s total population and renders an annual gross domestic product of $641 million.[10] However, tourism appears as an alternative industry to offer a sustainable management plan for American Samoa that conserves the marine environment and promotes the archipelago’s natural resources and cultural heritage. The American Samoa Economic Development Implementation Plan highlights tourism as a major sector of activity and includes objectives such as investing in key recreational activities (e.g., snorkeling, recreational fishing, SCUBA diving), building additional infrastructures for cruise ships, and increasing the number of recreational watercrafts visiting American Samoa for leisure, provisions, and maintenance.[11]

In American Samoa, the island of Tutuila remains the strategic focus of most policies due to its population density and the potential of its tourism industry to target beyond the “tourist profile”.[12] Tutuila hosts the capital, Pago Pago, where business travelers, citizens visiting relatives, and locals use and benefit from the tourism infrastructures. Tutuila has a mosaic of MPAs, regional management areas, and the National Park of American Samoa. The latter stretches across a wide swath of the island’s north shore and is the only United States National Park in the southern hemisphere. All these areas are zoned “multi-use” and allow both commercial and recreational fishing. The strategic and sustainable management of these areas depends on creating policies that include investments in tourism that balance marine conservation, and direct (e.g., fisheries) and indirect (e.g., tourism) ecosystem services.[8]

Coastal and marine environments constitute increasingly important environments that can offer open-space recreational activities.[13] As the number of marine recreational activities (MRAs) increases, managers must identify and understand what influences recreationists’ preferences for different sites.[14] Some of the most popular and fastest-growing MRAs, such as SCUBA diving, directly rely on the availability of specific marine resources.[15] In other small Pacific islands, identifying key features that constitute potential locations for these MRAs, as well as the construction of underwater trails within MPAs, have been proposed as management strategies.[16] These trails would stretch along coastal areas, highlighting an area’s scenic beauty and the generally high level of fauna present in it.[16] There are direct links between areas that are considered pristine, areas with high levels of biodiversity, and areas that are of interest to people practicing MRAs.

In Tutuila, “ecotourism is the preferred means of promoting tourism and the economy in the territory”, which highlights the importance of evaluating the potential for diverse MRAs in the waters surrounding the island.[17,18] The goal of this work is to predict the locations where specific MRAs are likely to be practiced around Tutuila Island, based on the known positive relationship between seafloor complexity, species diversity, abundance, and biomass, and interest for MRAs.[19,20]

Methods

The approach used to quantitatively predict the location where specific MRAs are likely to be practiced is based on the theories behind species distribution modeling.[21,22] Species distribution models are produced by quantifying the spatial relationships between known occurrences of a response variable and a suite of explanatory variables and using that knowledge to predict the probability of occurrence of the response variable in areas where no record of it exists, but where explanatory variables are available. In this study, we test whether seafloor characteristics can predict human use of the sea (i.e., MRAs) in Tutuila, American Samoa (Figure 1).

To build our response variable, we accessed data representing known human activities in Pago Pago collected during the American Samoa Coastal Use Mapping Project conducted in July 2012. The data were collected through a participatory workshop designed to represent spatial data on human uses of the nearshore and coastal marine environment in the region known as Fagaloa. The data were generated as a joint effort from the National Oceanic and Atmospheric Administration (NOAA) Pacific Islands Regional Office, the NOAA

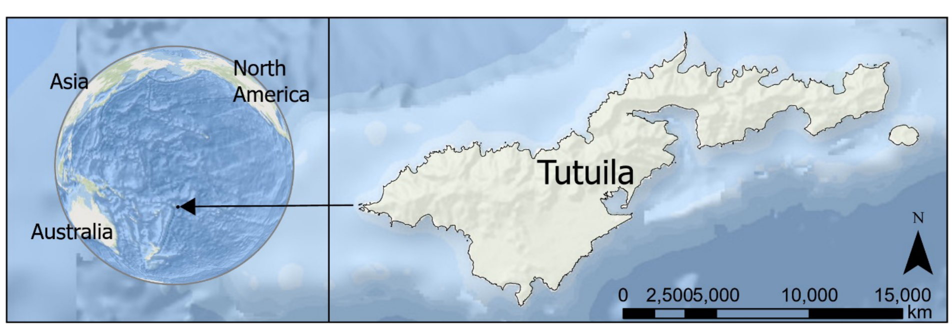


Figure 1: Map of the location of the study site: Tutuila, American Samoa, in the South Pacific Ocean.

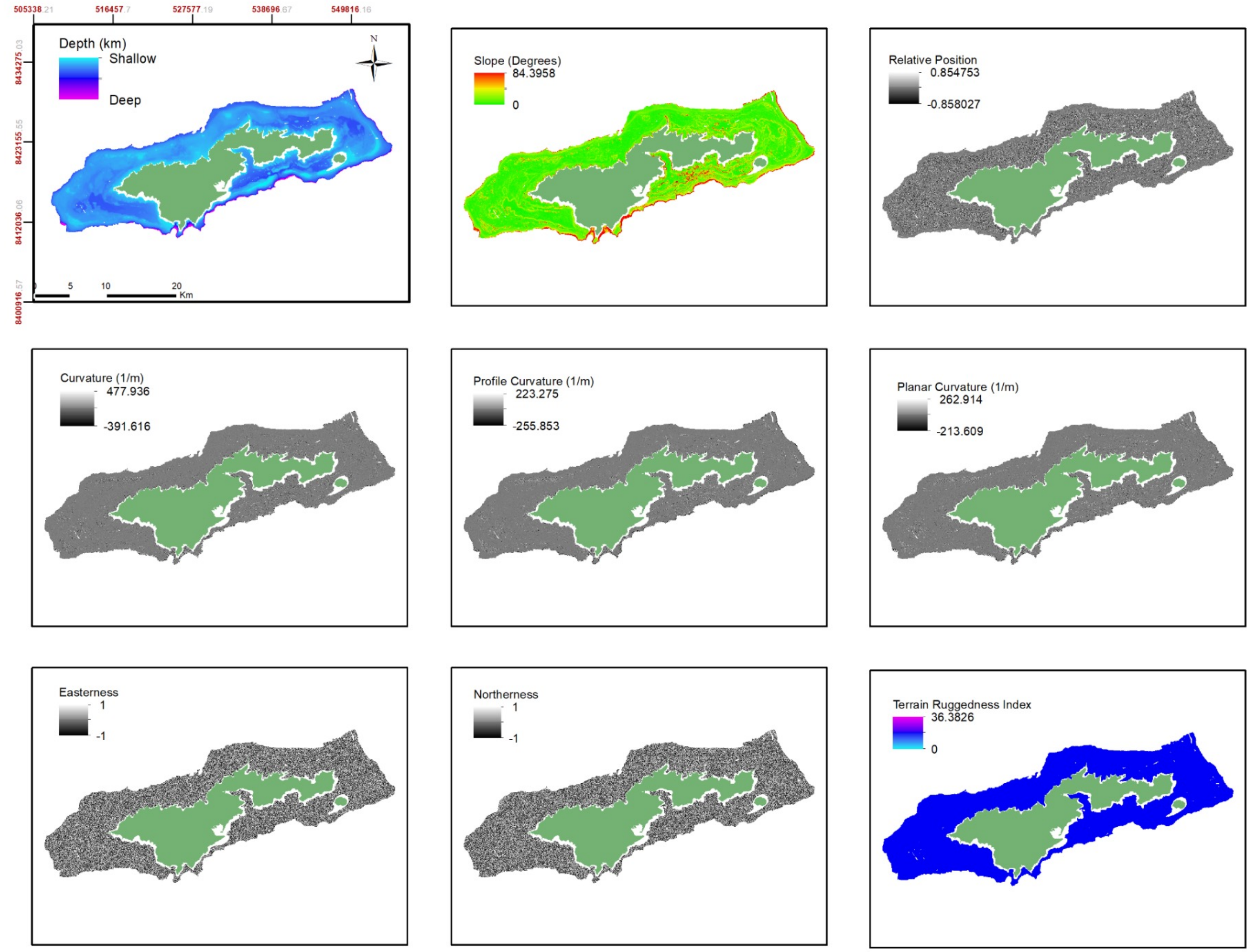


Figure 2: Maps of bathymetry and the derived terrain attributes around Tutuila Island that were used to analyze the suitability for human activities. In this context, "suitability" refers to areas where environmental conditions (derived from bathymetric data) match the preferred or optimal characteristics for a particular MRA.

Pacific Services Center, the American Samoa Department of Commerce Coastal Management Program, the American Samoa Department of Marine and Wildlife Resources, and the American Samoa Environmental Protection Agency. The information collected through the workshop was used to map a suite of MRAs' distribution, and was reported by participants in the form of polygons. The MRAs used for this study were SCUBA diving, snorkeling, spearfishing, gill netting, rod and reel fishing, and surfing.

The workshop data, i.e., the polygons representing the spatial extent of each MRA, were digitized. To generate occurrence data for our models, we randomly distributed points within these polygons following the ratio of one point per 100 m^2, with a minimum distance of five meters between any two points to ensure spatial representation of the reported activity areas. The species distribution model was then trained using 70% of these occurrence points, while the remaining 30% were reserved for validation, allowing us to assess model performance and predictive accuracy.

We then accessed multibeam bathymetric data collected from January to March 2004, and from February to March of 2006 by NOAA's Coral Reef Ecosystem Division, the Pacific Islands Fisheries Science Center, the Pacific Islands Benthic Habitat Mapping Center, and the School of Ocean and Earth Science and Technology at the University of Hawaii.[23] The resulting dataset has a spatial resolution of five meters and covers 331 km^2 around Tutuila (Figure 2). A suite of terrain attributes known to best characterize topographic complexity was derived from the bathymetry in ArcMap 10.7 and WhiteBox GAT 3.4: slope, a terrain ruggedness index (TRI), northerness, easterness, general curvature, planar curvature, profile curvature, and relative position.[24,25,26] TRI is a metric used to quantify the variation in seafloor elevation or depth within a specified area, reflecting the complexity or roughness of the terrain. Northerness and easterness are derivatives of the orientation of the slope and can be proxies of currents; curvatures indicate whether a surface is concave or convex in particular directions; and relative position is a measure of whether an area is more elevated or less elevated than its surroundings.[27] All these measures are commonly used in marine habitat mapping and species distribution modeling.[22,28,29]

The points representing each activity were used as the response variable in MaxEnt 3.4.1, a software that produces species distribution models based on maximum entropy principles.[30] The terrain attributes and bathymetry were used as explanatory variables and input in MaxEnt to test their potential to drive the distribution of the different MRAs. Actual distribution models are created by MaxEnt, i.e., maps of the probability of occurrence for each activity across the extent of the bathymetric data. Models were validated using bootstrap with ten replicates, and the Area Under the Curve (AUC) was used to quantify the reliability of the output models. Jackknife analyses of variable contribution were performed to identify the percentage of contribution of each explanatory variable in explaining the response variable's distribution. The resulting numerical probabilities displayed by the model were grouped into five probability classes: very high (> 0.8), high (0.6-0.8), medium (0.4-0.6), low (0.2-0.4), and very low (<0.2). These five classes were mapped for each activity to identify potential areas for specific MRAs as well as areas with high potential for multiple complementary MRAs.

Finally, a polygon representing the waters contained within the National Park of American Samoa section of Tutuila Island was digitized. The resulting polygon was overlapped with the different models to assess the park's potential to host each of the MRA analyzed and contribute to the discussion on ecotourism within the national park.

Results

We found high-probability areas for all six MRAs analyzed in the waters surrounding Tutuila Island (Figure 3).However, less than 5% of the area was highly suitable for most MRAs – except for SCUBA diving, for which 16.5% of the area was suitable (Table 1). When the probabilities of all MRAs are combined, highly suitable areas include the waters closest to the coast and some offshore reef areas (Figure 4). Snorkeling (0.6%) and gill netting (1.5%) were the two MRAs with the least suitable area around Tutuila, while SCUBA diving was the MRA with the most suitable area (16.5%). Spearfishing and surfing both had 4.5% of the area that was highly suitable, and rod and reel fishing had only 3.2%.

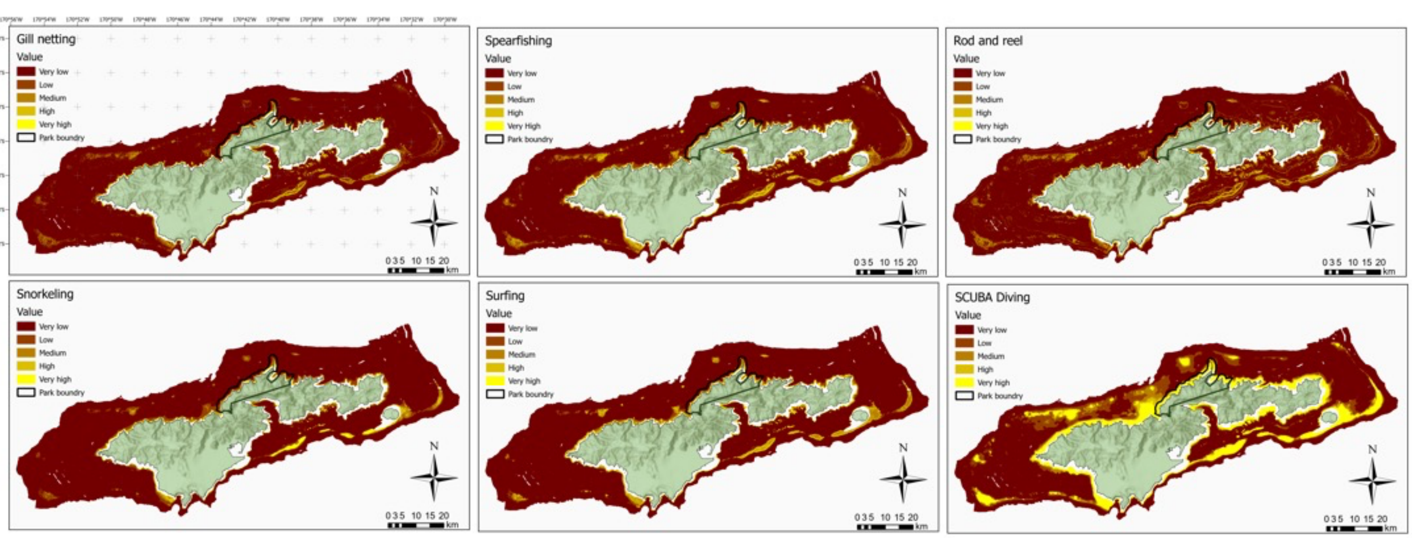
In general, the models' AUCs were relatively high (Table 1): the models for gill netting, rod and reel fishing, surfing, and snorkeling had AUCs above 0.9 (i.e., outstanding[31]), and the model for spearfishing had an AUC of 0.885, which is considered excellent.[31] Only the AUC score of the model for SCUBA diving was below the acceptable mark of 0.7, yet the model performed better than random (i.e., AUC higher than 0.5).[31]

Considering the contribution of the environmental variables, the percentages differed for each activity. However, depth and rugosity – measured with the TRI – were the dominant explanatory variables. The predicted distribution of SCUBA diving was 99.8% explained by bathymetry and 0.2% by TRI. However, these results are to be cautiously interpreted because of this model's relatively low AUC value. The model for snorkeling attributed 90.4% of the prediction to bathymetry, 4.2% to relative position, and 3.4% to TRI. The model for spearfishing was 66.6% explained by bathymetry and 32.8% by TRI. The model for surfing ranked bathymetry first with an 81.5% contribution and TRI second with an 18.1% contribution, and the model for gill netting scored 62.7% from bathymetry and 35% from TRI. Lastly, the rod and reel fishing model is the only one that did not identify bathymetry as the primary explanatory variable; TRI contributed 57.1% to the distribution model, and bathymetry contributed 41.6%. The other explanatory variables, such as curvatures and slope, had little to no contribution to the different models.

Potential areas for the development of the six activities were identified within the waters contained in the National Park of American Samoa portion of Tutuila (Figure 5). Excluding SCUBA diving, which was suitable in 78% of the park but provided the least reliable model, spearfishing was the activity with the highest amount of suitable area within the park's waters (14.88 km^2; Table 1). Snorkeling was the activity with the lowest area of probable space (1.86 km^2; Table 1). The other MRAs had highly suitable areas varying between 14.6% and 23.2% of the extent of the national park. In general, the most suitable areas were located closest to the coastline.

The SDMs were trained using quantitative data collected during a participatory workshop, which aimed to represent human activities in the coastal marine environ-

Figure 3: Suitability of Tutuila's waters to host the different MRAs.



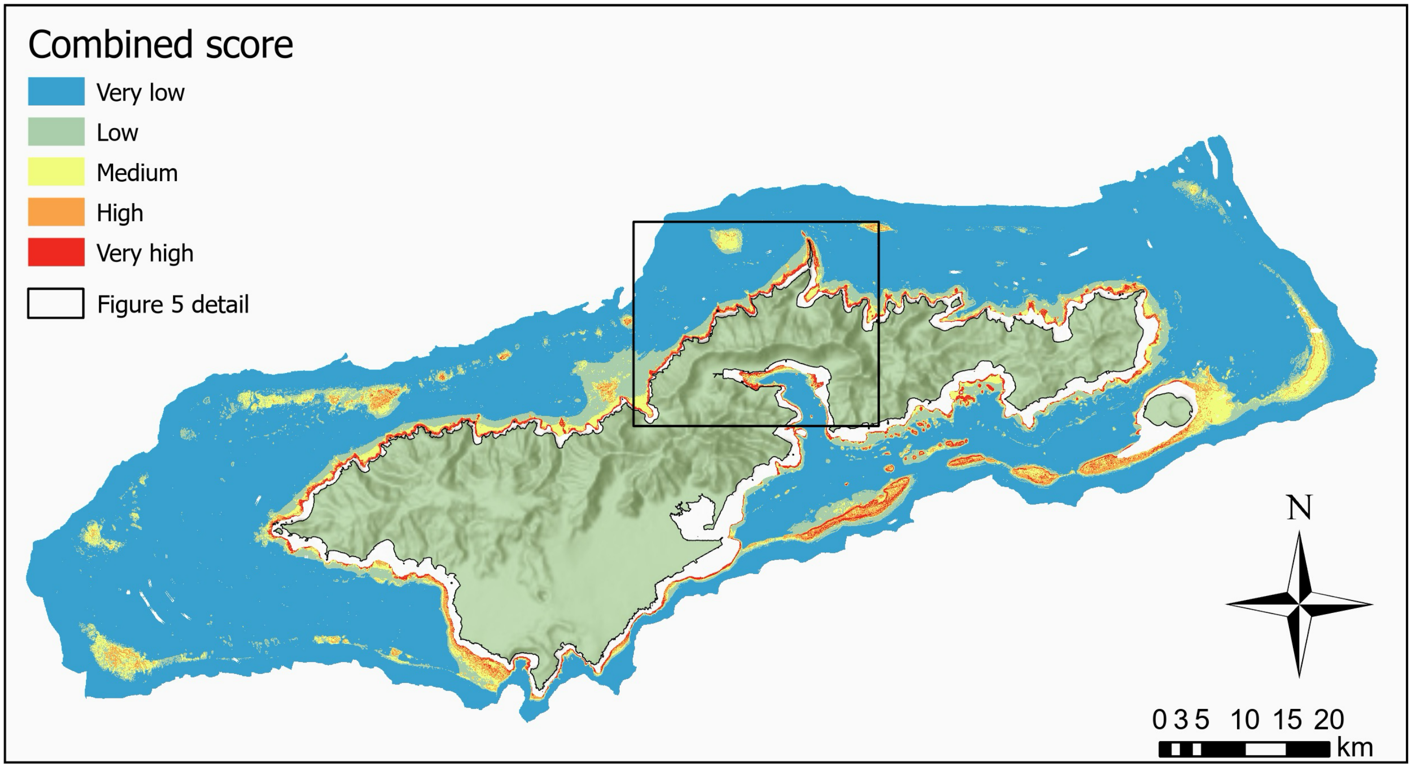


Figure 4: Map of the combined potential score for all activities analyzed around Tutuila Island. The black rectangle refers to the extent of Figure 5.

ment in the area known as Fagaloa around Tutuila Island. The workshop data consisted of spatially explicit information on MRAs mapped as polygons representing the areas where these activities were reported. Figure 6 compares the reported MRA polygons from the workshop and the values estimated by the SDMs. This analysis reveals a strong agreement between the two datasets within the workshop's focus area, indicating a good model fit and validating its predictive capabilities (as shown by the performance scores for each activity in Table 1). Additionally, the figure highlights previously unreported areas identified by the model as suitable for MRAs, demonstrating the potential of this approach for enhancing resource management, marine conservation, and ecotourism decision-making around Tutuila Island

Discussion

Results indicate that bathymetry is the seafloor variable that most explained the distribution of all activities. However, some activities stood out by being explained almost entirely by bathymetry, namely SCUBA diving, snorkeling, and, to a lesser extent, surfing. In contrast, the gill netting, spearfishing, and fishing models indicated a more significant relative contribution from rugosity as measured with TRI. These general patterns divide the MRAs into two categories: the "swimming" activities, which include snorkeling, SCUBA diving, and surfing, and the "fishing" activities, i.e., spearfishing, gill netting, and rod and reel fishing.

In the case of swimming activities, the substantial contribution of bathymetry may indicate that bathymetry is a surrogate for distance from shore. Indeed, snorkeling and surfing often rely on the proximity of the resources of interest (i.e., fauna, waves) from the shore. Water depth and distance from shore are indeed important components of snorkeling activities, as shallow, eutrophic systems near coastal margins tend to have high biomass and high productivity.[32] For surfing, bathymetry is likely to also act as a surrogate of distance from shore, yet 18% of the distribution of suitable areas for surfing was explained by rugosity. In this case, TRI likely captured the topographic complexity of the underwater features necessary for forming desirable surface water conditions like waves, contrasting with other MRAs that may primarily require proximity to shore.

The unreliability of the SCUBA diving model may be caused by a bias in the distance from shore that is captured by the bathymetric data. Indeed, the average distance from the shore of the SCUBA diving input data was significantly higher than for the other MRAs because of the location of one big dive site further offshore. This may have biased the MaxEnt model and overpredicted the suitability of the study area for SCUBA diving, thus resulting in a lower AUC. We also expected rugosity to have a greater contribution to the predicted distribution of SCUBA diving as this MRA requires divers to look for places with certain levels of fish richness and biodiversity, which are characteristics of more complex and rugose areas.[18,33] However, the bias associated with distance from shore in the input data, combined with the tendency of recreational divers to seek specific depth ranges that relate to their level of certification as well as the habitable depth ranges of charismatic macrofauna may further explain why bathymetry came out stronger than rugosity to explain the predicted distribution of this MRA.[34]

For the fishing activities, both bathymetry and rugosity contributed significantly to the predicted distributions of these MRAs. These activities are directly related to a higher abundance and diversity of fish, and it has been previously shown that the higher the rugosity of an area, the higher the fish diversity.[18,35] We can thus assume

MRA	Probability	Total Area (km²)		National Park Area (km²)	
Gill netting AUC: 0.984	Very low Low Medium	309.88 9.69 4.66	98.5%	3.28 0.38 0.38	85.4%
	High Very High	3.02 2.30	1.5%	0.39 0.30	14.6%
Rod and Reel AUC: 0.946	Very low Low Medium	293.49 15.63 9.69	96.8%	2.85 0.41 0.39	77.0%
	High Very High	6.16 4.36	3.2%	0.53 0.56	23.0%
SCUBA diving AUC: 0.602	Very low Low Medium	224.36 34.49 16.21	83.5%	0.26 0.41 0.39	22.4%
	High Very High	9.74 44.54	16.5%	0.46 3.21	77.6%
Snorkeling AUC: 0.997	Very low Low Medium	322.01 3.67 1.78	99.4%	3.92 0.28 0.19	92.8%
	High Very High	1.09 0.77	0.6%	0.18 0.16	7.2%
Spear fishing AUC: 0.885	Very low Low Medium	276.76 26.85 10.83	95.5%	1.78 1.25 0.37	71.7%
	High Very High	8.04 6.84	4.5%	0.44 0.90	28.35
Surfing AUC: 0.921	Very low Low Medium	294.52 10.30 9.81	95.5%	2.30 0.60 0.74	76.8%
	High Very High	8.68 6.01	4.5%	0.36 0.74	23.2%

Table 1: Results by MRA, including AUC (Area Under the Curve) scores and probability score classes for the entire study area and within the National Park of American Samoa.

that the higher the rugosity, the higher the fishing success is off Tutuila Island. Bathymetric and other topographic characteristics act as environmental surrogates that capture underwater structures, such as reefs, that promote fish aggregation off Tutuila's coast.[33]

When focusing on the results associated with the National Park of American Samoa portion of Tutuila (Figure 5), we found that the activities analyzed have a significant portion of highly suitable areas within the park. Based on these results, the management of the park should include and promote economic opportunities associated with MRAs, in addition to more regular natural resource management strategies. Indeed, it has been shown that MPA's ecological effectiveness directly increases when more diverse groups of stakeholders are included and allowed to use the managed area.[36] The simultaneous inclusion of biological conservation targets and socioeconomic needs of local communities represents an innovative approach to assessing MPA's effectiveness.[37,38] As MPAs on Tutuila Island, and more specifically the National Park of American Samoa, are zoned "multi-use", there is a high economic potential associated with enhancing recreational activities like MRAs. The data on MRAs used in this study and produced through a participatory workshop further highlight the value of local stakeholders' environmental knowledge. The overlap of the data on MRAs with different terrain attributes shows that MRAs occur in areas of the seafloor with particular underwater features and, indirectly, high biodiversity and bathymetric diversity. With that, this study shows that the involvement of different stakeholders is a key feature of successful management decisions that promote marine conservation and local economic development centered on ecotourism, and that is aligned with relevant cultural practices of the Samoan people.

Further work could improve the reliability of the models built by including distance from urban centers as an explanatory variable. Some offshore regions that are potentially suitable for human use may not be viable for the agencies and businesses that seek to conduct activities there. Because of a lack of infrastructure between these areas and urban centers, some of the suitable hotspots in our models may not be economically viable and thus should not be included as suitable. This demonstrates the potential use of the data produced by this study and highlights an opportunity for further research into this subject. The relatively low AUC value of the SCUBA diving model also demonstrates that topography alone cannot explain the distribution of this activity and therefore cannot predict which other areas are suitable for it. This result thus highlights that a greater number of different explanatory variables could potentially improve the models. As such, more environmental variables, such as substrate type and underwater habitat, or any other element that may influence the distribution of human activities on the water, should be included in future work. However, such data would need to be continuously measured over the entire extent of the bathymetric data to enable the modeling to work. More human use data outside of the Pago Pago area would also help improve the reliability of the models.

Finally, the higher suitability of areas close to shore highlights the need to fill the littoral gap in seafloor data. Collecting bathymetry in shallow waters is very challenging. Multibeam data often cannot be collected in very shallow waters, and bathymetric lidar or satellite-derived bathymetry data need to be collected to fill the data gap.[27] However, satellite-derived bathymetry often does not produce data at a high enough resolution for many purposes and would likely not match the resolution of the multibeam data from deeper waters.[27] On the other end, airborne lidar data collection is very costly and can be limited by turbidity and other water characteristics.[27] We note that

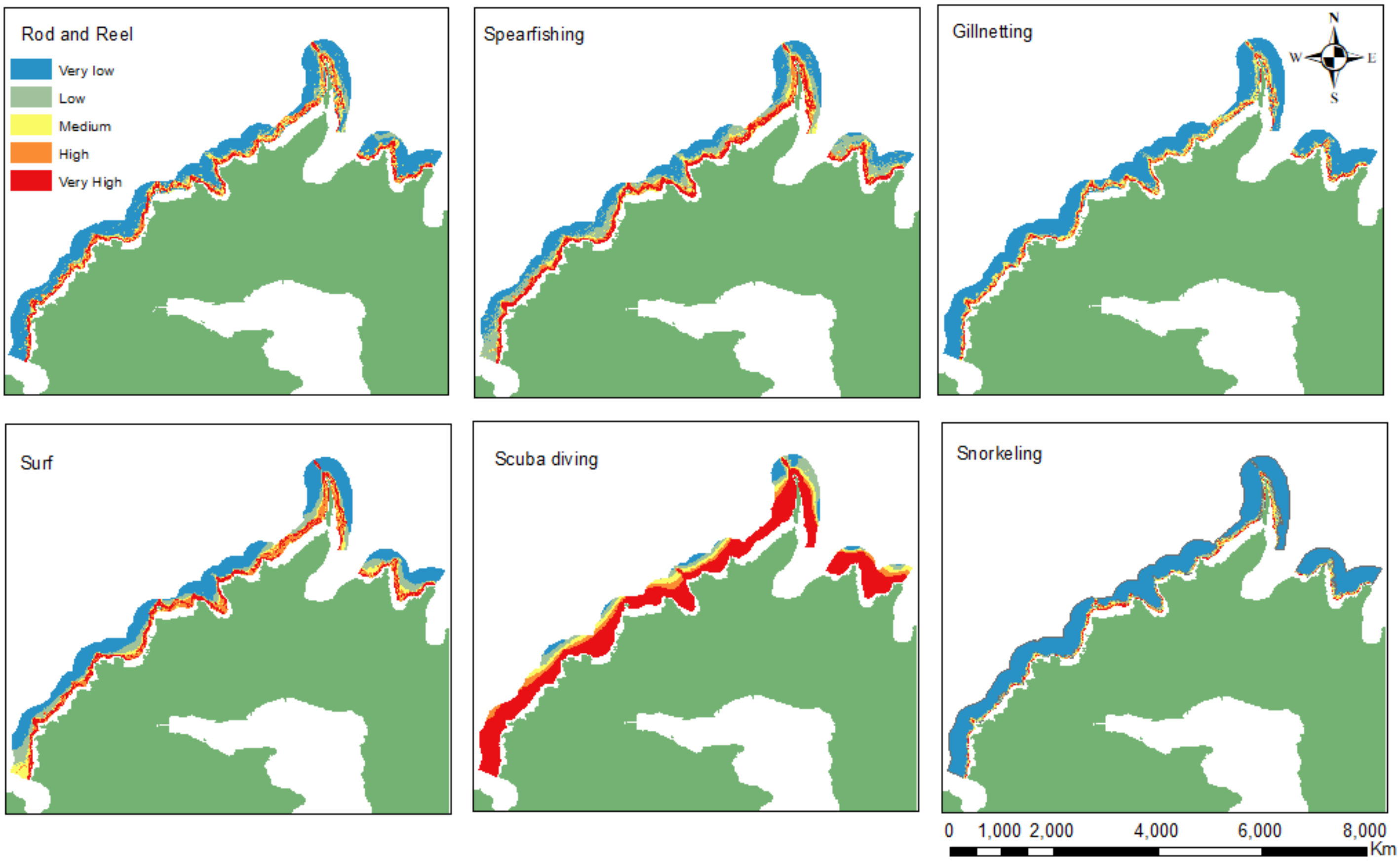


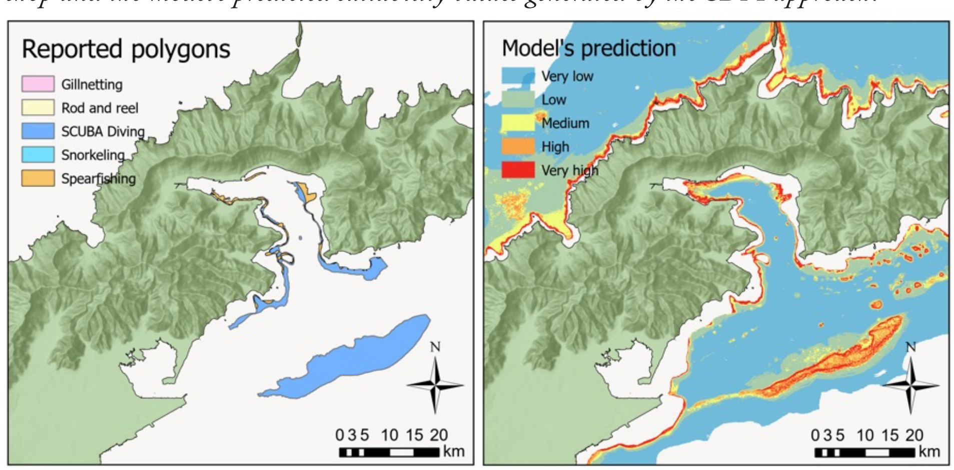
Figure 5: Suitability maps for the various MRAs in the marine section of the National Park of American Samoa on Tutuila. The location of the extent that is shown is displayed in Figure 4.

if the littoral gap were to be filled with data comparable to the multibeam bathymetric data that were used, the percentage of highly suitable area for many of the MRAs studied would likely increase significantly, both in the National Park of American Samoa and elsewhere around Tutuila Island.

Conclusion

This study identified areas that are suitable in the waters of Tutuila Island, including within the National Park of American Samoa, for six marine recreational activities (gill netting, spearfishing, rod and reel fishing, snorkeling, surfing, and SCUBA diving). Here, "suitable" refers to areas where environmental conditions (derived from bathymetric data) match the preferred or optimal characteristics for a particular MRA. We found an important spatial overlap between areas of documented MRAs and the bathymetric characteristics of the seafloor. This supports our conclusion that MRAs have the potential to increase ecotourism in American Samoa. The results indicate that the waters surrounding Tutuila Island are most suitable for SCUBA diving, with 16.5% of the area classified as highly suitable, while spearfishing and surfing each had 4.5% of the area classified as highly suitable; additionally, gill netting and snorkeling were found to have only 1.5% and 0.6% of the area, respectively, that was highly suitable. This indicates a clear preference for more complex seafloor environments, particularly in shallow waters. As we recognize the limitations of our study, we believe that the analytical approach conducted represents a practical, fast, and straightforward approach to assessing the potential of certain areas to accommodate different human activities based on environmental surrogates. This is particularly relevant in American Samoa, which lacks a diverse economy and has limited resources.

Figure 6: Comparison between MRAs polygons reported during the participatory workshop and the model's predicted suitability values generated by the SDM approach.



Identifying areas of economic opportunities by targeting the natural resources that can be used by MRAs through ecotourism will help management efforts in Tutuila and other Pacific islands. Identifying such areas within the National Park of American Samoa is also of great importance to increase the effectiveness of the existing MPA.[39]

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Reading for change: Exploring the impact of participation in an anti-racist book club on undergraduate students' perspectives and actions

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Abstract

This study aimed to understand the impact of a book club experience on honors college students' anti-racist thoughts, feelings, and commitment to action. This research finds efficacy of book clubs in positively changing attitudes toward racism for a nouvelle population. Book clubs have had a long history of challenging learners to examine power structures and patterns within the status quo.[1] With this in mind, the book club sought to push students to examine racism and power within systems. In the study, undergraduate students read the text titled *This Book is Anti-Racist*, written by Tiffany Jewell.[2] Participants met virtually for one hour each week, for four consecutive weeks, in order to engage in an interactive book club that focused on topics including systemic injustice, identity, privilege, and responding to racism. Qualitative and quantitative data were collected in the form of pre- and post-book club surveys, adapted from Polleck, to measure change in racist views, knowledge, and practices.[3] Several key themes emerged from the data, including a deeper understanding of the societal cost of racism and higher rates of acceptance, inclusion, and celebration of diversity. Participants also showed a change in belief of what constitutes racism, as well as an increase in commitment to take action against racism in everyday life.

Introduction

From May–July of 2020 in the United States, there were over 7,000 demonstrations calling for racial equality.[4] With racism becoming a topic widely discussed due to such demonstrations, people were more eager than ever to learn about racism, understand the passion behind protesters' actions, and form an opinion for themselves. Still, racism remains prevalent and influential in American Society. Statistics reveal racist inequities present in systems such as housing, education, health care, policing, and countless others.[5] For instance, a 2019 poll from Pew Research Center shows 82% of African Americans feel they are treated negatively based on their race in terms of hiring, pay, and promotions.[6] Furthermore, Black Americans remain overrepresented in deaths caused by the police.[7]

With such staggering statistics, a need for community quickly emerged; a space where people could learn, grow, and be vulnerable without fear of judgment or ridicule. Noticing these needs, researchers aimed to observe and understand the impact of a book club experience centered on the text, *This Book is Anti-Racist*, on participants' understanding of and actions toward racism.[8]

Literature review

The term book club, as used in this study, describes a group of people reading an agreed-upon text and coming together during and/or after that reading experience to engage in a text-based discussion. The learning that occurs throughout a book club experience can begin to be explained by Rosenblatt's Transactional Theory, which describes reading as a two-way exchange between the reader and the text. Readers interact with the text, form opinions, ask questions of the text, and connect new information to previous knowledge.[9] During a book club conversation, these ideas can be shared in what has been described as *exploratory talk* or *dialogic talk*, resulting in a deeper understanding of the text than one can achieve independently.[10,11] With the addition of new perspectives, opinions, and questions from other members of the discussion, members of small-group book clubs can begin to engage in collective thought, also called *interthinking*, in which participants creatively problem-solve, create meaning, and understand others' opinions and perspectives as a unit.[12,13] This fosters what Pollock describes as "transformative experiences," which are experiences that impact an individual's beliefs, preferences, and/or values.[14]

Book clubs have had a long history of challenging learners to examine power structures and patterns within the status quo.[15] With this in mind, the present study sought to understand the impact of an anti-racist book club on participants' understanding of and actions toward racism.

Methodology

Participants

The current study was conducted on the campus of a public university in the northeastern United States serving a population of predominantly white, middle-class, suburban, undergraduate students. Participants were recruited from a group of students registered for a synchronous, virtual book club facilitated by the undergraduate researchers and hosted by the University's Honors College. Book club attendees received a complimentary copy of *This Book is Anti-Racist* via mail and earned a small number of points toward an Honors College graduation distinction.[16] Following appropriate Institutional Review Board approval (*Protocol #: 2021-088-17-A*), participants in the study were recruited via email from the group of undergraduates registered for the book club. In subsequent emails, optional and anonymous pre-club and post-club electronic surveys were distributed to this group of interested study participants. Surveys included disclosure and participant consent that their anonymous survey responses would be analyzed for research purposes and potentially shared as part of a research study. No incentive was provided to, and no information was collected to identify those who completed the surveys. Due to this, some participant demographic data are unknown.

Study participants—meaning those who consented to participation and completed the anonymous surveys—were 16 undergraduates in the pre-club and 10 in the post-club. Data shown in this study include all surveys taken in pre-club (16) and all surveys taken in post-club (10). Due to the anonymity of these surveys, data is unable to be matched to remove the six participants who did not opt to complete both surveys. All participants were undergraduate students and members of the University's Honors College.

Book Club Text

The book club text, *This Book is Anti-Racist: 20 Lessons on How to Wake Up, Take Action, and Do the Work*, was selected due to its clear descriptions and practical examples, interactive components such as journal prompts and challenges to take action, accessible language and length (160 pages), and reliable resources such as a glossary and suggested texts for further reading.[17] The book is divided into four sections: identity, history of racism, action against racism, and continuing activism.

Procedure

The book club was organized into four, one-hour weekly sessions, with each session focusing on one dedicated portion of the book. These book club meetings occurred virtually due to both safety concerns related to the COVID-19 pandemic and the convenience of participants since meetings occurred during the University's summer break.

Participants were divided into three groups, which remained consistent for the duration of the book club. The groups, of 5-6 participants each, were kept small in order to create a comfortable and intimate space and to promote rich conversation, deeper connections, and open-mindedness through the development of meaningful relationships. To maintain the integrity of student identity, the participant group was not specified on club surveys; it is unclear how one's assigned group impacted their individual survey responses.

Each group was assigned one student moderator. Student moderators were the organizers of the club and had previously participated in a faculty-led book club focused on the chosen text. Book club sessions were student-led with no predetermined questions or prompts other than those suggested in the text itself. Moderators facilitated authentic discussion and guided conversation to relevant topics, however their role was as a peer-leader rather than a supervisor. Moderators met prior to and following each book club session to promote alignment and consistency among groups. Participants were encouraged to complete the journal prompts and challenges embedded in the text, and they were discussed during the book club meetings, however, data was not collected to understand to what extent participants engaged in these suggested interactive activities.

Research Question

This study seeks to understand: In what ways did participation in an anti-racist book club change participants' 1) knowledge of, 2) dispositions toward, and 3) commitment to action regarding racism and anti-racism?

Measures

This mixed methods study utilized an anonymous, electronic survey, adapted from Polleck, consisting of seven (pre-club) or nine (post-club) short-answer items and nine Likert scale items.[18] The survey was administered once before book club participation and again at the conclusion of the book club. Items were related to 1) participants' understanding of commonly used terms (i.e. racism, diversity), 2) their beliefs related to privilege and systemic inequities in society, and 3) their experience with and actions when experiencing or witnessing racism, including microaggressions. The pre- and post-club surveys were the same with the addition of two questions requesting feedback about the book club experience itself added to the post-club survey. The unabridged surveys are available in Appendices A and B.

Data analysis

Thematic Analysis was employed for analysis of open-ended survey items. Thematic Analysis is a qualitative research method in which data is collected and analyzed to uncover patterns and themes that emerge directly from the data itself, rather than predetermined themes.[19] Each of the three researchers individually conducted repeated readings of responses, noting key themes as they emerged. Following this iterative process, the researchers met and came to consensus regarding emerging themes and returned to the data to code. This allowed qualitative responses to be assigned numerical values.

Means were calculated for each 10-point Likert scale survey question on both surveys and a two-tailed t-test analysis was applied to determine statistical significance of changes between the pre- and post-club responses.

Findings

Quantitative Findings

Survey questions included nine Likert scale responses to statements with 1 representing *strongly disagree* and 10 representing *strongly agree*. Table 1 lists mean participant responses on both the pre- and post-club surveys. Data showed significant movement toward *strongly agree* for the statement: *ethnicity is an idea created by humans (not biological)*, $t(9) = 2.4597$, $p = 0.015$. Findings indicated a significant movement toward disagreeing with the statement: *reverse racism exists*, $t(9) = -2.3895$, $p = 0.020$. Additional statements that did not yield statistically significant findings are also listed below in Table 1.

Emerging Themes from Quantitative Responses

Key themes from quantitative data include a more robust understanding of racism's meaning, a clear belief in racism's presence in society, a movement toward seeing race and ethnicity as human constructs rather than biological inevitabilities, and a consistent understanding of how participants' own identities impact their privilege. These overarching themes reflect a shift in participants' perspectives and awareness.

Defining Racism: A general understanding of how students defined racism and how those definitions changed throughout the experience can be inferred from the quantitative findings. Specifically, views of racism being perpetuated by institutions slightly increased in the post-survey (M=9) from an already strong agreement in the pre-survey (M=8.11), and consensus surrounding this systemic understanding of racism increased (decrease in SD). This aligned with Jewell's description of racism as "personal prejudice and bias AND the systemic misuse and abuse of power by institutions."[20]

The belief in the existence of reverse racism, defined as prejudice against a privileged racial group, declined from pre- (M=6.44) to post-survey (M=3.6). This finding may relate to the increased understanding that societal institutions perpetuate racism, as these topics were intertwined in the text and the definition of racism above. Despite this notable decline in agreement with the statement, there was less consensus among participants following the book club than prior to the experience. The reason for this is not clear, however it may be attributed to some participants' lived experiences including hardships despite privilege.

Racism's Presence in Society: Both before and after the book club experience, participants consistently agreed that racism is present in our society (M>9). Consensus among participants was also strong (SD < 1). A slight decrease in the mean response seen in the post-test may be attributed to the smaller pool of post-survey participants and does not negate the overall finding that participants feel strongly about racism's societal presence.

Race and Ethnicity as Human Constructs: Jewel states, "Seeing how every country has a different way of classifying people shows us that race and ethnicity really are social constructions."[21] Following book club participation, an increase was shown in participants' opinion that both race and ethnicity are human constructs, therefore not biological (post-survey M≥8). From the pre-survey to the post-survey, the perception of ethnicity as a human construct increased, rising from a mean of 5.22 to 8.00—an increase of almost 34%. Understanding of race as a societal construct yielded a strong consensus following book club participation (M=9.6).

Identity and Privilege: Participants demonstrated a strong initial and continued understanding of their intersecting identities and how they impact their experiences, strongly agreeing to the following statements (M>9): *I am confident in my own identity, In our society certain people have privilege above others,* and *I understand what aspects of my identity grant me privilege or lack thereof.* Slight increases in agreement with the statement (M) and increased

Table 1: Descriptive statistics of quantitative pre-club and post-club survey responses

	Pre-club survey		Post-club survey			
	M	SD	M	SD	t-value	p-value
Racism is present in our society.	9.80	0.63	9.50	0.85	-0.8182	0.421
Societal Institutions inherently perpetuate racism.	8.11	2.08	9.00	1.26	1.2737	0.220
Reverse racism exists.	6.44	2.33	3.60	4.01	-2.3895	0.020
Race is an idea created by humans (not biological).	8.28	2.72	9.60	0.97	1.4767	0.147
Ethnicity is an idea created by humans (not biological).	5.22	2.96	8.00	2.93	2.4597	0.015
I am confident in my own identity.	9.06	1.59	9.70	0.48	1.2414	0.219
In our society certain people have privilege above others.	9.33	1.53	9.70	0.48	0.7306	0.466
I understand what aspects of my identity grant me privilege or lack thereof.	9.56	1.04	9.60	0.70	0.1202	0.904
I am confident I could intervene if I witness something racist.	7.94	2.15	8.30	1.49	0.4619	0.645

consensus (decrease in SD) was noted for each of these identity and privilege-related questions in the post-book club survey.

These themes are mirrored and further described in the qualitative findings.

Emerging Themes from Qualitative Responses

Several key themes emerged through analysis of open-ended responses. The most notable differences found between the pre- and post-club surveys related to a more robust understanding of constructs such as diversity and racism, an increase in awareness regarding the societal costs of racism, and a commitment to action in response to racist words or actions.

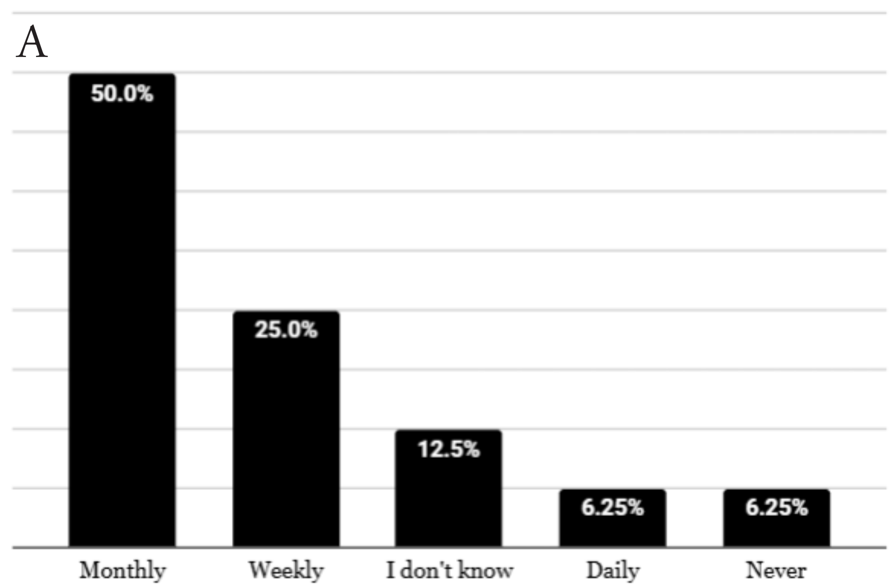
Defining Diversity: One way in which participants' responses changed between the pre- and post-club surveys regarded the definition of diversity. In the pre-club survey, there were an overwhelming number of responses that defined diversity as people with differences, co-existing. For example, one participant responded to the question *Define diversity* with the response, "A group with a range of different people including sexuality, gender, race, and other differences." In contrast, post-club survey responses tended to use terms such as *accept, include,* and *celebrate* when referring to diversity, rather than simply acknowledging that differences exist. Example responses include, "Diversity is the presence and acceptance of a variety of people from different backgrounds, viewpoints, ethnicities, races, etc." and "Diversity is the celebration of those not within the box of dominant identity."

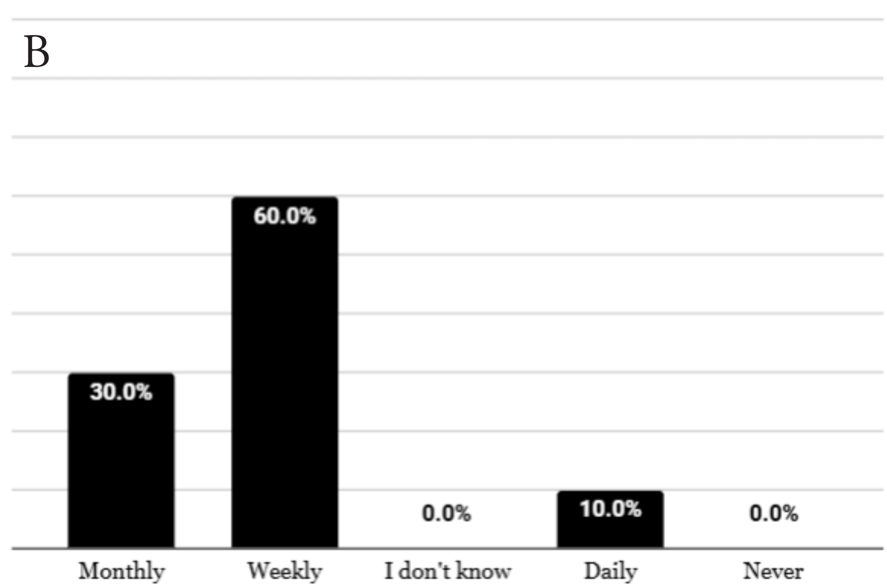
Defining Racism: Another notable difference in the pre- and post-club open-ended responses was the ways in which participants defined racism. As was the case with the quantitative findings, researchers observed a movement toward Jewell's explanation of racism as "personal prejudice and bias AND the systemic misuse and abuse of power by institutions."[22] The pre-club survey responses to the question, *Define racism*, almost exclusively (all but one response) defined it as personal prejudice including: discrimination, judging, stereotyping, or treating people differently based on the color of their skin. When the same question was asked in the post book-club survey, 70% of responses referred to *both* institutional racism and personal prejudice in their definitions.

Jewell defines microaggressions as "insult[s], slight[s], or hostile, negative message[s] to folx who do not fit into the … dominant culture" through either words or actions.[23] As illustrated in Figures 1A and 1B, respondents showed a dramatic increase in reports of the frequency of witnessing or experiencing microaggressions between the pre- and post-club surveys. The pre-club survey results showed that the majority of students had witnessed microaggressions in their life, but not very often. 12.5% of participants reported not knowing what a microaggression is and 6.3% reported never having witnessed one. Interestingly, post-club results showed 100% of students knew what a microaggression was and stated they had witnessed a microaggression. Researchers attribute these differences, not to an increase in microaggressions, but rather to an increased awareness and self-reflection regarding past instances.

Societal Costs of Racism: The data indicated a significant change in participants' ideas about the ways in which racism harms others—as well as harms society as a whole—when comparing pre- and post-club survey findings. Prior to the book club, many participants did not view racism as something that impacts their personal experiences in any meaningful way. When responding to the question, *How does racism impact you?*, responses were statements such as, "I am not affected in my daily life" and

Figure 1A: Pre-survey responses to the question "I witness microaggressions…"
Figure 1B: Post-survey responses to the question "I witness microaggressions…"





"In a small town I don't think it affects me much…" There was an obvious shift in ideas following the book club experience toward empathy and the costs one pays when perpetuating racist systems, indicated by statements such as: "Racism affects me by suppressing the ideas, voices, cultures, and much more, of people around the world who could be making a difference if they were not being oppressed" and "Racism belittles those I love and gives me power I did not earn."

Commitment to Action: Two of the biggest book club takeaways for the participants were 1) understanding what actions they can take when witnessing racism and 2) a commitment to act. Jewell presented two major categories of action that could be taken: *calling in* (circling back to a hurtful or oppressive comment a person made at a later time, privately, in order to educate them) and *calling out* (immediately letting a person know their comments or actions are harmful, even in a public space).[24]

Participants were asked three questions regarding disrupting racism and their anticipated responses when witnessing racist words or actions. Prior to the book club, participants largely expressed they would have adverse internal emotions if they witnessed someone being racist but would not feel comfortable speaking up. Statements included, "I would probably react negatively but am less likely to approach that person." Others confessed they would not know what to do at all, writing: "I'm not sure [how I would react to someone being racist]." Following book club participation, undergraduate students exhibited confidence in actions they can take to disrupt racism such as, "I can explain to them why it is racist and help educate them to do better in the future" and "I could record racist acts on my phone." It was clear from subjects' responses that confidence built through book club participation will motivate them to act in the future.

Impact of the Book Club Itself: The post-club survey matched the initial survey with the addition of the following questions: *What did you enjoy about the book club?* and *What could be improved?* Participants expressed a fondness and appreciation for the experience of the book club itself. One participant stated, "As the club progressed, I felt myself becoming more comfortable with the group and opening up to share my opinions." Another said, "It was a place to talk freely about racism without being ridiculed." The consensus among participants was that the experience was positive and fostered the trust necessary to accept new information.

Conclusion

This study examined how participant's knowledge, dispositions, and commitment to action changed as a result of participation in an anti-racist book club. Our findings suggest each of these areas was impacted by book club participation.

Knowledge

The researchers confidently conclude that participation in the book club influenced participants' understanding of concepts such as diversity, race, and racism, as supported by the data. Participants' understanding of diversity moved from people with differences coexisting to members of society accepting, including, and celebrating differences. Their understanding of racism transitioned from involving individual discrimination alone to an understanding that racism is deeply rooted in societal institutions. Participants increasingly rejected the construct of "reverse racism" as their understanding of the intertwining of racism and power grew. Following the book club experience, participants more consistently considered race and ethnicity societal constructs, rather than biological. They grew to better understand the meaning of "microaggressions" and were better able to identify examples from their own experiences.

Dispositions

Book club participants' dispositions were also impacted, with data illuminating themes of empathy and understanding toward individuals who have differing identities. Participants concluded that racist acts may not always hurt them specifically, but these acts do negatively impact individuals, the community, and the world they live in. Post-book club, a collective commitment to empathy and social justice transpired, emphasizing the broader impact of racism and the shared responsibility of creating a more inclusive society. Participants also demonstrated a positive disposition toward the experience itself, describing the book club as a space to explore previous biases and an accepting entrance into an anti-racist journey.

Commitment to Action

An empowering finding was an increased commitment to take action against racism following book club participation. After the sessions, study participants moved from wanting to act, but not knowing how, to confidently describing how they'd either call in or call out others committing racist acts or expressing racist words.

Discussion

Interpretation of Findings

The book club was a space committed to growth and built on trust. In order to enact real, meaningful change, people must be willing to have difficult conversations, difficult and *uncomfortable* conversations. By individuals revealing areas they seek growth, the group acknowledged that no one had all the answers, but rather everyone was there to learn from the text, consider new perspectives, discuss, and grow. After all, the power lies in realizing that what one has been led to believe isn't always true—and in choosing to seek the truth for oneself. This work initiated real changes to the participants' knowledge, beliefs, empathy, confidence, and commitment to take action against racism in society and established systems, exemplifying what Polleck describes as "transformative experiences."[25] These findings support the researchers' expectation that participation in an anti-racist book club positively impacted the undergraduate honors students' knowledge and attitudes about racism.

Limitations and Future Research

While these findings are encouraging, some limitations of the study must be acknowledged. Future researchers should consider the following steps to address these limitations. Book club meetings were held online due to the COVID-19 pandemic, so the additional layer of an in-person connection should be explored in future research. Data analysis could be bolstered by increasing participant sample size, while maintaining the small 5-6 person, book club groups. Additionally, it could be beneficial to administer additional surveys after each section of the book to assess which topics were the most impactful and to gather more detailed insights on the impact of specific discussions. Survey questions about participants' completion of the interactive components of the book would provide further data about the particular impact of those activities. Future researchers should also consider forming surveys capable of linking pre- and post-club responses whilst maintaining anonymity. This could allow for a clearer comparison about specific ideological changes and dissuades potential biased data from participants who only completed one of the two surveys. A future study could be conducted solely on how participants' understandings of microaggressions are impacted by an anti-racist book club, as this was one of the most significant findings in the current study. Finally, this study specifically focused on honors college students, and the results may vary when applied to different population groups. It is likely that different demographic characteristics could lead to varied outcomes, and further exploration of this aspect is suggested to better understand these potential differences.

Implications

It is hoped that this work will inspire other researchers, educators, and leaders to seek to replicate and expand on the positive impacts these findings demonstrate through new iterations of an anti-racist book club. After all, many small changes together create a big change and that, in turn, will slowly move society toward an anti-racist future.

Acknowledgments

We'd like to extend a special thank you to Kai Bright and the Slippery Rock University Honors College who contributed greatly to the success of this research, and to Dr. Elizabeth LaGamba, whose guidance and support is responsible for lighting the fire and continuously fueling the flame.

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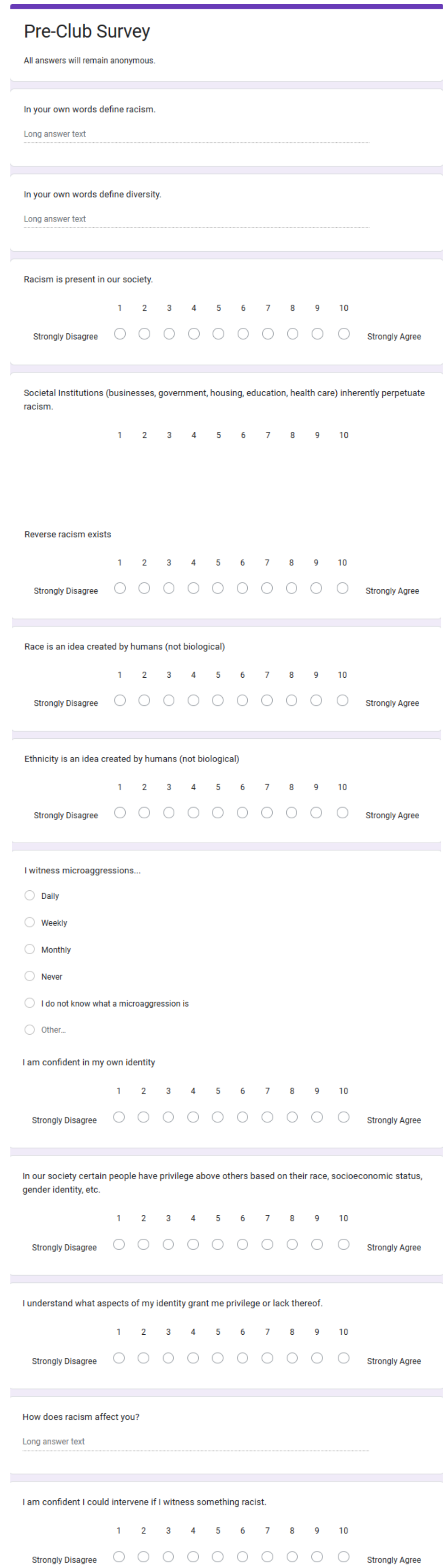
Appendix A



Pre-Club Survey

All answers will remain anonymous.

In your own words define racism.

Long answer text

In your own words define diversity.

Long answer text

Racism is present in our society.

Strongly Disagree 1 2 3 4 5 6 7 8 9 10 Strongly Agree

Societal Institutions (businesses, government, housing, education, health care) inherently perpetuate racism.

1 2 3 4 5 6 7 8 9 10

Reverse racism exists

Strongly Disagree 1 2 3 4 5 6 7 8 9 10 Strongly Agree

Race is an idea created by humans (not biological)

Strongly Disagree 1 2 3 4 5 6 7 8 9 10 Strongly Agree

Ethnicity is an idea created by humans (not biological)

Strongly Disagree 1 2 3 4 5 6 7 8 9 10 Strongly Agree

I witness microaggressions...

- Daily
- Weekly
- Monthly
- Never
- I do not know what a microaggression is
- Other...

I am confident in my own identity

Strongly Disagree 1 2 3 4 5 6 7 8 9 10 Strongly Agree

In our society certain people have privilege above others based on their race, socioeconomic status, gender identity, etc.

Strongly Disagree 1 2 3 4 5 6 7 8 9 10 Strongly Agree

I understand what aspects of my identity grant me privilege or lack thereof.

Strongly Disagree 1 2 3 4 5 6 7 8 9 10 Strongly Agree

How does racism affect you?

Long answer text

I am confident I could intervene if I witness something racist.

Strongly Disagree 1 2 3 4 5 6 7 8 9 10 Strongly Agree

What actions could you take to disrupt racism?

Long answer text

How would you react if a friend or family member said something racist? Why?

Long answer text

How would you react if a stranger said something racist? Why?

Long answer text

What does an antiracist world look like for you?

Long answer text

This survey data will be analyzed to understand the impact of this book club on honors college students to improve future programming. We would also like to use the results of this anonymous survey for research purposes. Do you give your permission for your answers to be used for research purposes? All information will remain confidential. *

- Yes
- No

Appendix B

What did you enjoy about the book club? What could be improved?

Long answer text

Heron on the water

By Penelope Bussard
Kenyon College

Artist's Statement

"Heron on the water" was created with techniques such as Frottage, Surrealism, and Automatism. I rubbed different hues of oil pastel on vellum paper, replicating the texture of various objects. I used textures from man-made objects to recreate those found in nature. These textures serve to emphasize the effects that mankind has made on nature. Continuing with this theme, I wanted to showcase the effects that micro plastics and other harmful pollutants have on marine life. I made the water multiple colors, replicating the colors oil spills create when combined with water. Also affected by oil spills, the fish have the same colors directly relating to the harmful pollution that is often carried through water. Additionally, I added dots and multiple shapes resembling microplastics that are consumed by many fish. Finally, there is a yellow light that is being projected onto the heron. It serves as a reminder that marine life will not be the only thing affected by these negative man-made effects.

Oil pastels, 8.5" x 16", 2025

Assessing insect frass for the cultivation of microalgae

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Abstract

The production of environmentally friendly and sustainable food will increasingly become a bigger problem due to the growing world population and environmental problems, such as climate change. One promising alternative to environmentally costly conventional meat as a protein source could be insects. Their production is a growing market, which leads to a higher amount of insect frass. Nowadays, insect frass is only converted thermally, which is not economically reasonable because it destroys phosphate and nitrate sources. Herein we investigate the possibility of using insect frass as a nutrient supply for the cultivation of microalgae. The microalgae species, *Arthrospira platensis, Scenedesmus obliquus*, and *Chlamydomonas asymmetrica* were tested for their growth on a medium containing insect frass. Our results demonstrate that insect frass improves the maximum growth rates of *S. obliquus*, whereas there was no significant impact on the growth of *C. asymmetrica*, and it shows reduced OD values for *A. platensis*. Generally, there is a potential to use insect frass as a nutrient supply, but further investigations are needed to assess suitability in continuous cultivation systems as well as analytics for the IFI medium, including the nutrient consumption.

Abbreviations

EU	European Union
I	Light intensity [µmol m^{-2} s^{-1}]
I_0	Average light intensity [µmol m^{-2} s^{-1}]
IFI	Insect frass infusion
K_I	Light affinity constant [µmol m^{-2} s^{-1}]
K_S	Substrate affinity constant
OD	Optical density
RSS	Residual sum of squares
S	IFI concentration [%]
SOT	Super optimal broth medium
t	Time [s]
X	Cell mass [g]
X_0	Initial cell mass [g]
ε	Absorbance coefficient
μ	Growth rate [d^{-1}]
μ_0	Maximum control growth rate [d^{-1}]
μ_{max}	Maximum growth rate [d^{-1}]
$\mu_{max,S}$	Maximum substrate specific growth rate [d^{-1}]

Introduction

Due to the growing world population and the current environmental problems, such as high land consumption, soil degradation, water scarcity or greenhouse gas emissions, the demand for sustainable and environmentally friendly food production is increasing.[1] The meat industry is especially marked by high carbon footprints.[2] As an alternative protein source, instead of meat, insects can be used for human consumption or as feedstock.[3] They can be brought up on up to a fourteenth of the space, use considerably less water, and release about 1% of the greenhouse gas emissions beef cattle typically release.[3-5] At the same time, they offer essential nutrients, are rich in proteins, and thus have a positive impact on a more balanced diet for humans and animals.[3,6] Due to the recent recognition of mealworms as foodstuff by the European Union (EU) and the subsequent expansion of the edible insect market, managing the by-products of insect production —primarily insect frass— will be increasingly challenging. This waste contains various nitrogen and phosphate sources, which need to be regenerated. The insect frass can be incinerated, used as fuel for combustion, or to manufacture derived products, such organic fertilizer in agriculture, transformed into biogas or disposed of in a landfill or biogas plant.[7,8] Hower the usage as fertilizer holds some environmental safety risks. Depending on the feed substrate and insect species, the frass can be contaminated with hazards including mycotoxins, dioxins heavy metals, pesticide residues, veterinary drugs, and human food borne pathogens.[9] Due to regulations in the European Union, the insect frass needs to be treated thermally (60min at 70°C) before it is sold.

Another way to ensure a sustainable, recyclable usage of insect frass is as a nutritional supply for microalgae; herein lies the focus of this paper. The upcycling of nutrients from insect frass has high potential to reduce the costs of media production and the need for additional chemical usage. Microalgae are currently under high industrial interest, since they can be used in the manufacturing of such derived products as biofuel, pigments, nutritional supplements, feed supplements, cosmetics, and pharmaceuticals.[10]

In this study the following three microalgae will be compared in terms of their growth rates with or without supplementation with insect frass: *Arthrospira platensis*, a cyanobacterium commonly known as *spirulina. Spirulina* is cultured worldwide and used as a dietary supplement to produce phycocyanin.[11] The second investigated algae is *Scenedesmus obliquus*, which, like *A. platensis*, can be used to treat wastewater.[12] Thus far, the capability of *A. platensis* and *S. obliquus* for wastewater treatment has been investigated because they are known to absorb nitrate and phosphate. *S. obliquus*, for example, can remove over 175.39 mg g^{-1} d^{-1} nitrates and 15.01 mg g^{-1} d^{-1} phosphate.[13] Furthermore, a variety of inorganic and organic compounds, such as metals or pharmaceuticals or personal care products, have wastewater that is degradable by *S. obliquus*.[12] *A. platensis* can remove 79.96% of total nitrogen, 93.35% of total phosphate, and 90.02% of chemical oxygen demand from a mixture of seawater and freshwater.[14] *Chlamydomonas asymmetrica*, a hardly researched algae, is known to have high value products like exopolysaccharides (EPS), which show antiviral activity as well as pigments and fatty acids.[15] This belongs to green algae and is externally similar to *Chlamydomonas reinhardtii*.

This study aims to investigate if insect frass from the larvae of *Tenebrio molitor* can be used as a nutrient supply and thus upcycled by microalgae. Thereby the mentioned species are screened and compared for if they are suitable for usage of the product. Through different media variations, the growth of the algae is investigated, working under the assumption that depending on the concentration of insect frass, and thus nutrition supply, different growth rates will become apparent.

Methods

Media preparation

The insect frass is collected larvae from Michael Beer's *Tenebrio molitor* farm in Neumarkt in der Oberpfalz, Bavaria. Thereby 1 kg of larvae gives approximately 900 g of insect frass over a breeding time of 9–12 weeks. The frass is mostly dried in the box during *T. molitor* cultivation in the box. It is taken as it is for further medium preparation. The nutrient rich medium, which is prepared, called insect frass infusion (IFI). It contains 1000 mL of deionized water and 6 g of insect frass. Preliminary tests determined the approximate needed concentration for the experiments. Boiling water is added to the frass, with subsequently autoclaves at 120°C for 20–30 minutes. The thermal treatment (with a duration of 20–30 minutes) is used to extract nutrients and enable a sterile medium. As controls, *A. platensis* is cultivated in an SOT medium and *S. obliquus* and *C. asymmetrica* are cultivated in an artificial freshwater AF6 medium at pH 6.6.[16,17] The mentioned reference medias are common medias for the respective strain, while SOT is a seawater medium including sodium bicarbonate as a carbon source and AF6 is a freshwater medium. All media were autoclaved at 120°C for 15 minutes.

Cultures and their growth conditions

The algae were cultivated in four Fernbach flasks (volume 250 ml, culture volume 125 ml) one for each tested concentration— on a reciprocating shaker (Promax 1020 and Heidolph Inkubator 1000) at 75 rpm. LED-light maintained the above-light supply at 250 µmol m^{-2} s^{-1}, measured at the flasks' location (LI-COR, Li-250A). The process temperature was 34°C, which is around the optimum temperature for *A. platensis* (30°C for *S. obliquus*) and even if it is higher than the optimum temperature for *C. asymmetrica*, it is suitable.

The IFI medium was tested with three different algae, including *A. platensis* (NIES-39) obtained from a culture collection, *S. obliquus*, *C. asymmetrica*, the two latter self-isolated from South Korea. All three were cultivated in a 5%, 10%, and 20% dilution of the IFI in deionized water, leading to the final insect frass concentrations of 0.3 g l^{-1} and 0.6 g l^{-1}, and 1.2 g l^{-1}. As a reference (0% IFI), each alga was additionally cultivated in the standard cultivation media, SOT for *A. platensis* and AF6 for *S. obliquus* and *C. asymmetrica*.

The inoculum was adjusted to be at an OD of 0.1, which is a common starting concentration for all strains.

Experimental procedures

Samples were taken daily and analyzed for optical density and cell count. The cultivation was stopped individually for each strain when the stationary phase was reached in the IFI flasks, and respectively, growth was not visible. The experiment was repeated twice for the successfully grown strains (only *S. obliquus*) for all concentrations including the control. The strains were only compared in suitability for cultivation on IFI. Differences in OD values caused by strain differences were eliminated, since values were interpreted relatively to their reference cultivation.

The optical density was measured with a UV-Vis spectrometer (photoLab® 7600 UV-VIS -WTW) at 750 nm to estimate the growth. A part of the sample was centrifuged and the supernatant (4000 g) was served as a blind value. The supernatant was prepared every day to avoid influence of changes within the medium. The samples were measured three times per flask for concentration, which were used to calculate the average.

The cell concentration was determined using a hemocytometer to verify that the measured changes in OD were not due to changes in morphology or pigment content of the microalgae but due to cell proliferation. Cell counting is only performed for *S. obliquus* and *C. asymmetrica*, since the morphology and size of *A. platensis* is not suitable for this method.

Parameter calculations

A monod kinetic is used to describe the growth parameters (Eq. 1.). The light intensity I is the limiting factor for calculating the growth rate μ.

$$(1) \qquad \mu = \mu_{max} \frac{I}{I + K_I}$$

Where μ_{max} is the maximum growth rate, and K_I is the light affinity constant. This model corresponds to a Type I model, where the expected culture growth is based on the average light intensity.[18] However, the growth rate is also influenced by the local light intensities inside the reactor, including the so-called self-shading effect.[19] As it neglects scattering effects, Type I models can be supplemented with Lambert-Beers-Law:

$$(2) \qquad I = I_0 \cdot e^{-X\varepsilon r}$$

This includes light attenuation as a function of the film thickness r, the biomass concentration X, and OD value, with the initial light intensity I_0 and the adsorption coefficient ε. Subsequently the system is completed with a Type II model (Lambert-Beers-Law), which calculates the average local growth rates at every location in the cultivation media. Because of the invariant reactor system, the light distribution can be considered constant in each experiment. Therefore, a simplified hybrid model for calculating the local growth rate after 2 cm depth (radius of the flask) seems sufficient, as those calculations serve merely as a plausibility check of the experimental data.
By inserting Eq. 2 in Eq. 1, the growth rate for Eq. 3 is given and used for numerical simulation with X_0 the inoculum *OD* value.

$$(3) \qquad x(t) = x_0 \cdot e^{\mu_{max} \frac{I_0 \cdot e^{-X\varepsilon r \cdot t}}{I_0 \cdot e^{-X\varepsilon r} + K_I}}$$

The model allows to determine the maximum growth rate for each individual cultivation independently from the starting biomass concentration. For fitting the numerical simulation of the algae growth to the experimental data, the gradient-dependent optimization algorithm Generalized Reduced Gradient was used, adjusting μ_{max} and K_I. As an assumption, the K_I value was set to constant for each algal species, adjusting only the μ_{max} value individually to the growth behaviour in the different media compositions. The target value for the error sum of squares (RSS) was set as zero to determine the minimum. The sum includes the error squares from all experiments conducted with each alga. The inoculum and film thickness used for the simulation are measured values. The numerical simulated *OD* is calculated in a step wide t of 0.021 d^{-1}.

Furthermore, the substrate dependent growth enhancement is verified by using the model from Tsao and Hanson with following equation[20]:

$$(4) \qquad \mu = \mu_0 + \frac{\mu_{max,S} S}{K_S S}$$

While μ_0 is the maximum growth rate reached in the control culture, S the IFI concentration and K_S the substrate specific parameter and $\mu_{max,S}$ the maximum substrate specific growth rate. The numerical simulation is fitted in a concentration step of 0.05% IFI. The target value for the error sum of squares (RSS) is set as zero to determine the minimum, while adjusting $\mu_{max,S}$ and K_S.

Results

Batch cultivations in shaking flasks were conducted to investigate the influence of the IFI on the growth behaviour of different algae. For validation of the experimental data and a more straightforward comparison of the growth-influential effect of IFI, the growth of all batches from *S. obliquus* was fitted to a growth model (Eq. 3).

In Table 1, all measured and calculated parameters for the growth stimulation of each concentration are listed. The μ_{max} was fit by all measuring points from each replication. Altogether, the simulation of the cultures performed best in the exponential phase and lagged accuracy in the stationary phase. However, to compare the growth, only the data from exponential phase is relevant. The maximum growth rate is increasing with the IFI concentration for *S. obliquus*. The fitting of the numerical simulation to the experimental data considers both growth experiments. With an RSS of 3.512, the cultivation of 10% IFI shows the worst correlation of the experiment to the simulation. The best fit has the cultivation in AF6 media, with an RSS of 0.215 (Table 1).

The cultivations of *A. platensis* and *C. asymmetrica* lacked measurements and thus data, which is why the model isn't used for these strains. Both experiments are only described by their indicated trend but need further repetitions.

Growth of A. platensis*:*

In the reference medium SOT, the culture grows exponentially for the recorded three days and is stopped subsequently within the dying phase of the other concentrations. Regarding all experiments with IFI, an initial growth was observed. At 5%

Table 1: Parameters used for the numeric simulation of the growth behaviour of A. platensis*,* S. obliquus*, and* C. asymmetrica.

Algae	Medium	Inoculum[OD]	μ_{max} [d^{-1}]	*KI* [µmol m^{-2} s^{-1}]	RSS
S. obliquus	AF6	0.204	0.331	10.399	0.215
	5% IFI	0.177	1.126	10.399	2.080
	10% IFI	0.158	1.837	10.399	3.512
	20% IFI	0.176	2.000	10.399	1.231

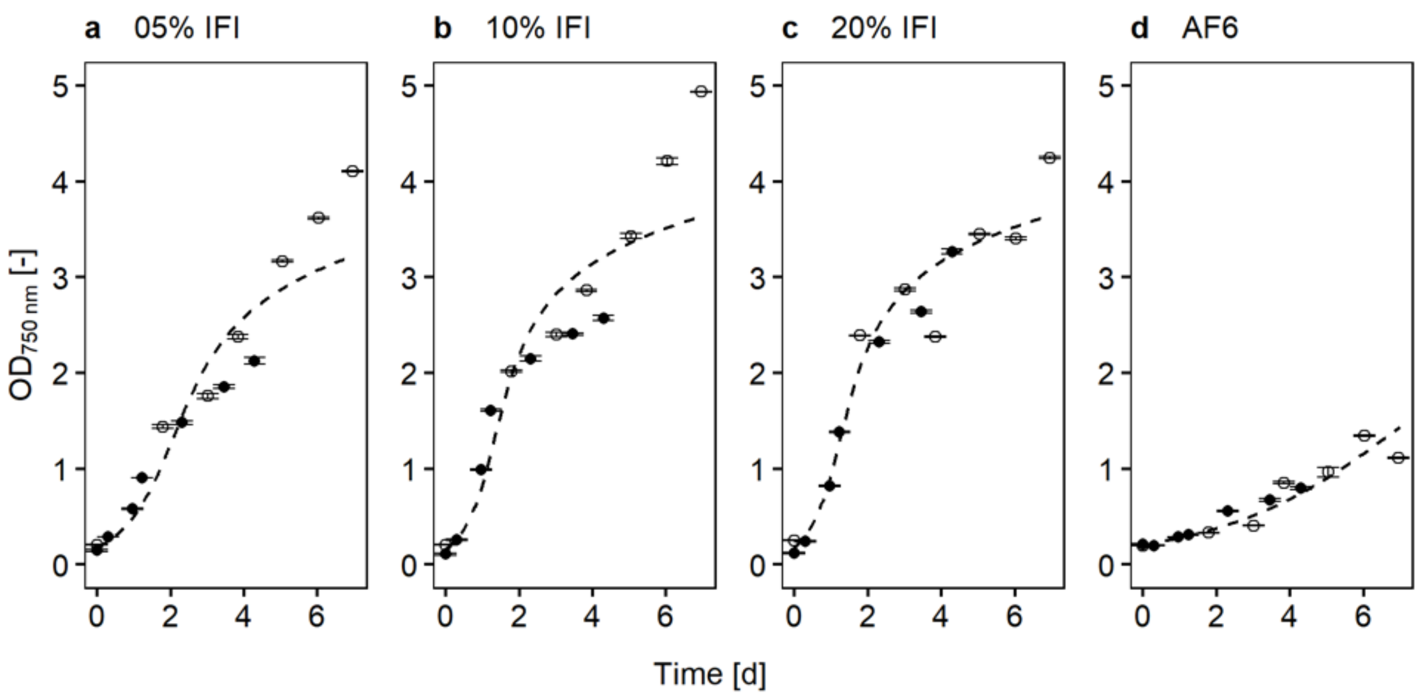


Figure 2: Growth of S. obliquus *at **a** 5% IFI, **b** 10% IFI, **c** 20% IFI concentration, and **d** the AF6 medium as reference. ○ indicates the first run; ● the second run; the dashed lines are the numerical results using Eq. 3.*

and 10% IFI *A. platensis* grew for about two days; at 20% IFI, the culture growth stopped after the first day. After reaching the stationary phase following 2.5 days, the cells started to agglomerate and subsequently died. The maximum OD is on average 0.702 ± 0.073 of all IFI concentrations, which is lower than the OD value after 3 days in the control with 1.202. Generally, the IFI media includes some turbidity from the frass. The centrifugated samples of *A. platensis* showed a decrease in turbidity residuals, leading to increased clarification of the media over the cultivation time. However, the experiment lacks data points and further replicates are required.

Growth of S. obliquus*:*

The same experimental setup as described for A. platensis was used to determine the influence of IFI on the growth of *S. obliquus*.

In all growth experiments with *S. obliquus*, an exponential growth phase began immediately, without an adaptation phase to the different media compositions (Figure 2). The lowest growth rate (μ_{max} = 0.3 d^{-1}) was determined for the culture grown on AF6 media. With increasing IFI concentration, the growth rate of the cultures increased. The highest growth rate (μ_{max} = 2 d^{-1}) was observed by the culture using 20% IFI (Table 1). The dependency of the growth rate on the IFI-concentration is similar to the substrate-growth relation according to Monod or enhanced growth according to Tsao and Hanson (Figure 5).[20] The growth curves slightly differ from the first trial to the second. While in the first experiment the exponential phase slows down after approximately 7 days, in the second trial the stationary phase is reached earlier. For the 5% IFI, the stationary phase started on day four in the second run and the cultivation was stopped subsequently; 10% and 20% IFI on day three. With the investigated IFI concentrations, a maximum in biomass growth could not be determined. On the other hand, within the reference AF6 medium, the maximum growth rate is lower than all IFI concentrations, as well as the highest OD value that was reached.

After the centrifugation, a layer of white insect frass fibres was observable on top of the algae pellet. This layer enlarged with higher IFI concentration. To verify the growth-enhancing effect of the IFI by consecutive batch cultivations, the cultures were split using the respective nutrient composition for consecutive cultivation—however, they died after a few days. The consecutive cultivation was performed with the same set-up (light intensity, temperature, IFI media concentrations). Therefore, the verification cultivation was carried out with algae from a fresh preculture (Figure 2, ● symbol).

In Figure 3, the measurement of the optical density over the cell concentration is shown. The linear progression validates the proportionality between cell count and OD, which states that OD increases due to proliferation and isn't influenced by differences in pigment concentration and cell size caused by the IFI.

Growth of C. asymmetrica*:*

To see if the growth-enhancing effect of IFI is related to the green algae metabolism, we also performed the growth experiments with another green algae, beside *S. obliqus*, called *C. asymmetrica*. Unfortunately, the experiments lacked measurement replicates and were only described superficially. For all IFI concentrations and the reference medium, *C. asymmetrica* started with exponential growth and reached a stationary phase in all flasks after around three days. Subsequently the experiment was stopped due to stagnating growth. The stationary phase was similar to the cultures experiments with *A. platensis*, followed by a death phase. The maximum OD averaged at 0.532

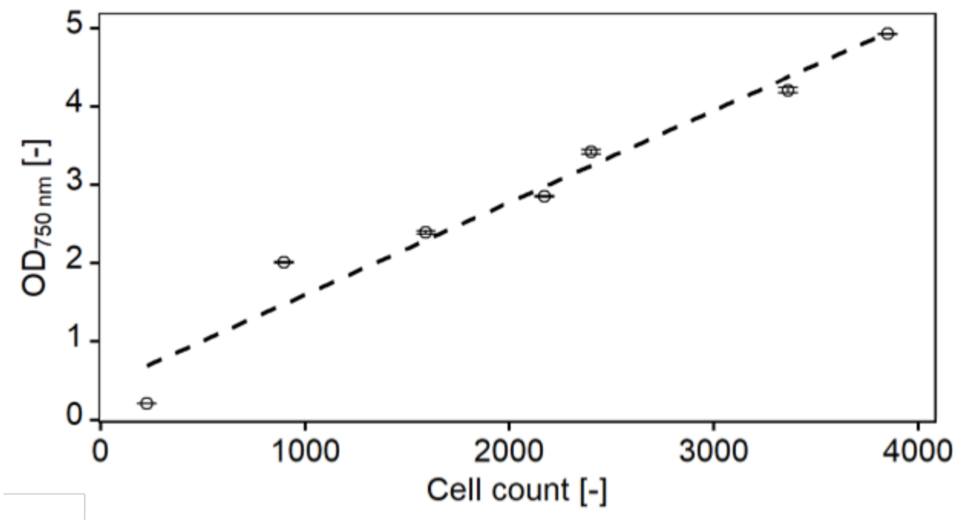


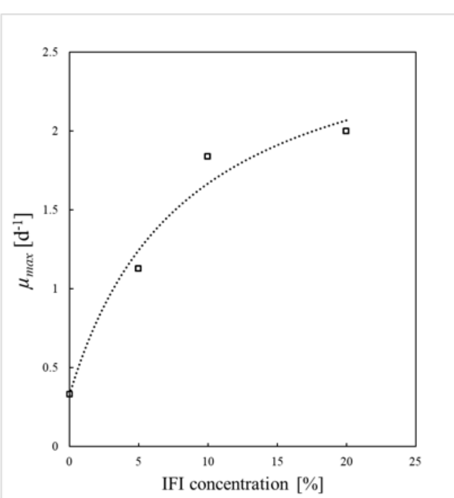
Figure 3: Comparison of cell count and optical density at 750 nm for S. obliquus *at 10% IFI concentration from the first run.*

± 0.044 in IFI and 0.452 in the control. Based on the results of the hematocytometer, no significant increase in cell number was observable in all IFI concentrations and in the control. Therefore, the correlation between OD and the cell count is not displayed as there is no significant correlation between them. Thus, no influence of IFI can be described.

Influence of IFI on maximum growth rates:

Summarized in Figure 4 is the correlations found between IFI concentration and the calculated μ_{max}. It is obvious that IFI enhances the growth of *S. obliquus*. The enhancement simulation confirms the substrate-specific improvements, with an RSS of 0.048. The substrate specific affinity constant K_S is calculated with 8.522 and the $\mu_{max,S}$ reaches a value of 2.48.

Figure 4: Enhancement simulation of the maximum growth rate μ_{max} *for* S. obliquus *over the percentage of insect frass in the infusion.*



Discussion

Using insect frass as a medium for microalgae shows mixed results, leading to species-dependent growth-enhancing or -inhibiting effects. In contrast to both *S. obliquus* and *C. asymmetrica* IFI seems to be growth-inhibiting for *A. platensis*. The growth is limited compared to the growth culture, which was indicated by lower OD values, shorter cultivation times, and, ultimately death of the culture. The clearing of the medium indicates that parts of the IFI are metabolised. However, due to amount of data, further cultivations are necessary to investigate the specific influence of different IFI concentrations.

For *S. obliquus*, all tested concentrations resulted in higher growth rates and higher biomass concentrations than the reference medium. Comparing the influence of IFI on *S. obliquus* in contrast to the reference medium results in a maximum OD value that is four times higher: 20% IFI. Since OD values are directly proportional to the biomass, IFI medium has potential for increasing biomass production processes with *S. obliquus*. However, in the future, further investigations are necessary for consecutive cultivations, like turbidostatic growth or fed batch, which are commonly used in industrial production. Also, the maximum growth rate in 20% IFI is 3.1 times higher than the growth rate reported by Li et al. in BG-11 medium.[21] This contrasts with Steinrücken et al., who cultivated *Chlorella vulgaris* on an IFI medium, and the growth was improved.[22] Steinrücken also showed that the medium does not influence the protein concentration of the strain, which supports our results that IFI can be used for cultivation of microalgae.[22] However, in the consecutive cultivation, *S. obliquus* died. Toxic effects from copper and zinc can be excluded since the concentration in this media reaches a maximum of 0.01-0.04 mg l^{-1}copper and 0.05-0.02 mg l^{-1}, under the assumption of 3.5 to 30.2 mg kg^{-1} copper and 99-145 mg kg^{-1} in dried insect frass.[23] At these concentrations, copper and zinc can improve the growth.[24] Another improving factor could be the presence of ammonium in insect frass (approx. 17 mg l^{-1} in 20% IFI), which is taken up to 100% by *S. obliquus* in waste water.[25] A lack of nutrients could be the reason for death in the consecutive cultivation. However, the main components, such as nitrogen, phosphate, potassium sodium, sulfur, and magnesium are sufficiently available in 20% IFI. Only vitamins are not available in insect frass.[23]

The other tested green algae, *C. asymmetric*a, didn't show any significant influence that can be related to IFI. Even if OD values and cell count doesn't match the trend stays the same. There isn't any difference between the IFI flasks and the control. Additionally, the maximum OD value in IFI cultures is similar to the control, which is a carbon-limited growth behaviour (since no additional carbon sources were used). Thus, it is indicated that IFI cannot be used as a carbon source for *C. asymmetrica*, because it was insufficient. Carbon limited growth leads to low biomass concentrations. The growth pattern, which was observed to show similar OD values, were reached in carbon limited cultures from Leitenberger et. al..[26] Cultivations with a carbon supply from CO_2 gas show more than a twofold increase from higher maximum OD values for *C. asymmetrica*. This indicates that the IFI medium is not nutrient-sufficient for this strain. However, further research can be done with additional CO_2 supply to determine a more significant influence of IFI on *C. asymmetrica*.

Conclusion

Different options for managing increased insect frass are now possible after considering the results and discussion from our research. Due to the positive effects on biomass and enhanced growth behaviour, IFI is an attractive nutrient source for *S. obliquus*. Since the consecutive cultivation of *S. obliquus* failed in IFI, using it as a sole nutrient source is not sufficient. The reason for this could be due to a lack of nutrients (e.g. vitamins) in the IFI. Also, toxicity by an accumulation of copper or zinc cannot be excluded completely since the content wasn't measured. Further investigations are required, including looking at turbidostatic cultivation and analytics about zinc and copper concentrations, and control about their toxicity. Additionally, vitamin solution should be added/considered.

For *C. asymmetrica*, no significant effects on growth were observed. After further testing, it could be used as a substitute for AF6, if adverse long-term effects can be excluded. Thereby additional CO_2 gas supply is recommended to avoid carbon limitation. For *A. platensis*, results showed a negative effect of the insect frass on the growth and vitality of the cultures. However more specific experiments are required. If the IFI medium should be used as a source of nutrients, further analysis should also show how efficiently the organisms utilize nutrients.

From an economic and ecological point of view, the use of insect frass is expedient, as the frass is otherwise thermally recycled, leading to additional costs and loss of nutrients. Using it instead to aid in microalgae production, which contributes to such a wide range of products from stockfeed to biofuels and even antiviral therapeutics, would prevent nutrient loss and improve sustainability as we consider scaling up the production of insects for consumption.[27] With further investigation, this application could be optimized for multiple species of microalgae at optimal concentration to promote growth and increase production of high-value products, while still preventing nutrient loss. The production of high-value products on strain as well as nutrient supply is why further optimization should also determine the influence of IFI on the high value products production.

Acknowledgments

We are grateful for the support and guidance of Prof. Dr. Christoph Lindenberger. We want to thank our fellow students for their contribution.

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The rhetorical triumph of Taylor Swift: Navigating Bitzer's *Rhetorical Situation* as a pop culture rhetorician

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Introduction

Taylor Swift is a pop culture icon. From her record-setting album sales, such as her 2014 album *1989* becoming the fastest-selling album in over a decade, to her historic wins at prestigious awards shows like the Grammys, where she became the first woman to win Album of the Year twice, Swift's achievements have consistently rewritten the rules of the music industry. These accomplishments are not just about musical talent, they are also a triumph over a backdrop of tumultuous personal and professional challenges. In the years leading up to her historic wins, Swift found herself involved in public controversies and confrontations with fellow celebrities which threatened to overshadow her musical achievements. Yet it was within this storm that Swift delivered a poignant acceptance speech that not only acknowledged her triumph, but also addressed broader societal issues, particularly the challenges faced by women in the music industry. Taylor Swift's 2016 Album of the Year acceptance speech can be analyzed through the lens of Lloyd Bitzer's theory of the rhetorical situation to gain a deeper understanding of how she navigated this pivotal moment to deliver a message that resonated far beyond the walls of the Grammy stage. Through mastery of the outside influences that surround a rhetorical argument, Swift constructed her rhetorical discourse not only to celebrate her own success, but also to offer guidance and empowerment to a generation of young women aspiring to follow in her footsteps. Studying the rhetorical situation, exigence, rhetorical audience, and constraints of her speech will provide a deeper and more thorough understanding of how Swift navigates the intricacies surrounding the rhetorical situation to solve modern feminist issues.

Literature review

A review of relevant scholarship

Current scholarship on feminist rhetoric emphasizes the importance of understanding its interdisciplinary nature. In her Chair's Address, *It's Bigger than Comp/Rhet: Contested and Undisciplined*, Gwendolyn Pough asserts that language must be considered an "interdisciplinary study", with connections to "social, economic, and political issues".[1] The inherent cross-functional nature of rhetoric gives those who study it the ability to "start…building on [their] own critical interdisciplinary studies" by questioning how their own language use exists in a broader cultural context.[1] Language, she argues, is not only incredibly valuable, but also capable of much more than previously recognized.[1] Those who use language, therefore have an obligation to "do it bigger and to reach every place and everyone we can reach".[1]

Similarly, Patricia Bizzell situates her analysis of rhetoric, in *What is a Discourse Community*, through discussion of the "language-using practices" of groups of people.[2] These discourse communities, as she defines them, are inherently interdisciplinary because their users are constantly overlapping with users of other communities. When they join, discourse community users are engaged in a form of political struggle, in which "socially privileged" speakers "tend to win".[2] However, Bizzell suggests that these conflicts are fundamentally valuable, as she writes, "the more conflicts, the more input from discourse communities at cross purposes, the more chance for an interested critique of one discourse community from another to be sparked".[2]

As one of the manifold conflicts that influence rhetoric, gender constitutes a major driving force in our society, determining "who gets to speak out, who should remain silent, who gets to decide, and when".[3] In *Feminist Rhetorical Practices: In Search of Excellence*, Gesa Kirsch and Jacqueline Royster point out that although gender is a uniting characteristic, there are "many ways in which personal identities shape, inform, and influence behavior (with rhetorical practices being defined essentially as human behavior)".[4] Cheryl Glenn argues in her work *Silence: A Rhetorical Art for Resisting Disciplines*, one way personal identities influence behavior is through the rhetorical practices of women, especially women from marginalized groups.[3] Specifically, the rhetorical practice of silence. "Besides," she writes, "if and when women speak up, they are admitting publicly that they have sustained damage (that is, they are no longer pristine), and they are also admitting their willingness to move into the even more public (that is, vulnerable) status of 'victim,' however that term might be defined".[3] This act of breaking silence is nevertheless a "transformation" that effects "resistance and creation" through the act of putting words to actions.[3]

Why, then, look at Taylor Swift in a

study of rhetorical practices? Surely, she is just one of many prominent and powerful women who have chosen to "break silence," to "speak the unspeakable and allow secrets to become common knowledge".[3] As Kirsch and Royster effectively point out, however, there is great value in "looking at people whom we have not looked before, in places at which we have not looked seriously or methodically before…at genres that we have not considered carefully enough".[4] Listening to those whom we find ourselves expecting to disagree with, or misunderstanding places valued in the experiences, beliefs, and ideas of women who "have much to teach us if we develop the patience to pay attention in a more paradigmatic way".[4]

The Rhetorical Situation

The Rhetorical Situation is an article by Lloyd Bitzer covering a theory of the same name. Published in 1968, Bitzer's article is incredibly important in the field of rhetoric and composition. *The Rhetorical Situation* presents a unified theory on the context of rhetoric; rather than prescribing rules and regulations for optimal rhetorical performance, Bitzer attempts to answer questions about the origins of a rhetorical argument. This exploration into context allows a discussion on how a rhetorician uses the outside influences of their audience, environment, and background, or their rhetorical situation to construct and alter their rhetorical discourse.

Bitzer defines a rhetorical situation as "a complex of persons, events, objects, and relations presenting an actual or potential exigence which can be completely or partially removed if discourse is introduced into the situation, can so constrain human decision or action as to bring about the significant modification of the exigence".[5] In other words, a rhetorical situation is a problem that can be solved with rhetoric. Bitzer asks rhetoricians to consider if the use of rhetoric can solve a particular problem, as he states, a rhetorical situation exists before the discourse, inspiring it, and does not depend on the existence of the discourse .[5] Rhetoric does not create a rhetorical situation. Instead, a rhetorical situation produces rhetorical discourse.

To explain a rhetorical situation, the following example can be considered. In a small town in America, a hypothetical automobile factory has been dumping oil waste into a river outside of the town. To avoid legal ramifications, they are using a loophole in the town legal code that allows them to "accidentally" spill up to 50 gallons of waste in a month. Because of the spillage, oil has started leaking into the town water supply, the fish and birds that live in the river are getting sick and starting to die at alarming rates, and the largest source of revenue for the town – visiting duck hunters – have stopped using town lands. The mayor, our rhetorician, has called an emergency city council meeting that is being attended by a large percentage of the town's population. The town is angry at the mayor, and they blame her for their environmental, health, and economic problems. This city issue is a rhetorical situation, because the mayor must redirect their anger and find a solution through rhetoric. The mayor cannot use rhetoric to reverse the pollution. She cannot change the legal code herself by speaking into an empty room. But she can use rhetoric to move her audience to vote on a new city law to remove the accidental spillage loophole.

For Bitzer, and for our example above, there are three things that must exist in any rhetorical situation: the exigence, the audience that can change the exigence, and the constraints which the rhetor must address. First, the exigence "is an imperfection marked by urgency; it is a defect, an obstacle, something waiting to be done, a thing which is other than it should be".[5] In our mayoral example, the exigence is the city law allowing the pollution of city lands that is causing hardship for the city's citizens. Pollution is not something that cannot be addressed, not only because of a moral obligation on the part of the mayor and the city council, but also because of pressure from the city's population and economic necessity. It is a problem "marked by urgency", and life cannot be the same until it is solved.[5]

Secondly, there must be an audience, specifically one that can change the exigence. Bitzer differentiates between a rhetorical audience and "a body of mere hearers or readers: properly speaking, a rhetorical audience consists only of those persons who are capable of being influenced by discourse and of being mediators of change".[5] For the mayor, it is all well and good for her to give her rhetorical speech to a class of sixth graders; they might learn a well-taught lesson on the importance of environmental activism and on drafting a law with no loopholes, but they are unable to help the mayor change the situation. Through rhetorical inspiration, the class might write a letter to the president of the automobile company asking her to stop polluting their river, or they might participate in a city-wide oil cleanup. However, neither of those things will solve the exigence. The president of the company might choose to dump her oil waste somewhere else, and the fish and ducks that live in the river might appreciate the students' effort, but ultimately nothing will change until the city law allowing that pollution is changed. While the sixth-grade class might be unable to solve the exigence, there is a rhetorical audience that can, i.e. voting age citizens of the city. If the mayor produces a convincing enough rhetorical argument at the emergency city council meeting, the voting members present can act on the exigence. Through their votes, they can solve the city's problem and change the law allowing the pollution; they can change the exigence.

Finally, a rhetorical situation must involve constraints. "Every rhetorical situation contains a set of constraints made up of persons, events, objects, and relations which are parts of the situation because they have the power to constrain decision and action needed to modify the exigence".[5] Bitzer classifies constraints into two categories: the constraints created by the rhetorician, and those that exist outside of their formulation. The constraints always affect the rhetorician's actions, even if they are unaware of them. The mayor must deal with the audience's anger, otherwise they might not listen to her, even if her idea solves their problem. She must also consider how changing the law will affect the automobile corporation – the president might choose to move the company somewhere else causing the loss of her constituents' jobs. The mayor might be unable to control the ways in which the town laws are able to be changed, but she must deal with those as well. Other constraints on the situation could be how many people showed up, how many people in attendance work for the automobile company, and how many of the voting members present are hunters. The time of day the meeting is taking place, the size of the room, the moods of the audience, and their demographics also impact the ability of the rhetorician to persuade her audience.

Bitzer's *The Rhetorical Situation* is an interesting opportunity to look deeper into the context surrounding a specific work, which is why the rhetorical analysis of Taylor Swift's 2016 Album of the Year acceptance speech will be through Bitzer's theory. Studying the rhetorical situation, exigence, rhetorical audience, and constraints of her speech will provide a deeper and more thorough understanding of how Taylor Swift navigates the intricacies surrounding the rhetorical situation.

The rhetorical argument

On February 15, 2016, five different artists competed for Album of the Year: Alabama Shakes, Kendrick Lamar, Chris Stapleton, The Weeknd, and Taylor Swift.[6] With credits to co-executors Jack Antonoff, Nathan Chapman, Imogen Heap, Max Martin, Mattman and Robin, Ali Payami, Shellback, Ryan Tedder and Noel Zancanella, Taylor Swift became the first woman to win Album of the Year twice. After a handshake with Jack Antonoff and hugs from friends and family, Swift took the stage and began her acceptance speech.

> I want to thank the fans for the last 10 years and the recording academy for giving us this unbelievable honor. I want to thank all of my collaborators that you see on this stage. Mostly, I want to thank my co-executive producer Max Martin who has deserved to be up here for 25 years. And as the first woman to win Album of the Year at the Grammys twice, I want to say to all the young women out there, there are going to be people along the way who will try to undercut your success or take credit for your accomplishments or your fame. But if you just focus on the work and you don't let those people sidetrack you, someday when you get where you're going, you will know it was you and the people who love you who put you there, and that will be the greatest feeling in the world. Thank you for this moment.[7]

There are a few specific parts of this speech that deserve to be highlighted in relation to Bitzer's rhetorical situation. The first, her audience: "I want to say to all the young women out there".[7] Taylor Swift is using the momentum from her achievement to address a very specific group of people. Secondly, her connection with her audience: "there are going to be people along the way who will try to undercut your success or take credit for your accomplishments or your fame".[7] Swift is deliberately calling attention to what is being said about her in the media (particularly the controversy regarding Kanye West) to lend credit to what she is telling her audience. She wants them to listen to her because of her personal experience. She knows what it's like to be criticized, and she knows that everyone listening will know *why* she knows what it's like. Finally, the advice that she gives her audience: "but if you just focus on the work and you don't let those people sidetrack you, someday when you get where you're going, you will know it was you and the people who love you who put you there, and that will be the greatest feeling in the world".[7] This advice is a deliberate form of persuasive rhetoric. She is using key parts of rhetorical theory to persuade her audience, i.e. young women, to continue succeeding despite the judgment and accusations. Her speech is particularly effective because she is acknowledging a problem, the audience that can solve that problem, and the context surrounding that problem. That is, in her 2016 Album of the Year acceptance speech, Taylor Swift is responding to a rhetorical situation.

Rhetorical analysis

To quickly review, the following rhetorical analysis will be conducted using Lloyd Bitzer's theory of the rhetorical situation. A rhetorical situation is made up of three parts: the exigence – the problem that can be solved through rhetoric, the rhetorical audience – the audience that can be persuaded through discourse to act on the exigence, and the constraints - the factors surrounding the rhetorical situation that the rhetorician must address. The subject of the following rhetorical analysis is Taylor Swift's 2016 Grammy acceptance speech, and to efficiently analyze her speech, the rhetorical analysis has been divided into three parts: the exigence, the audience, and the constraints.

The exigence

"And as the first woman to win Album of the Year at the Grammys twice…".[7]

Of the top twenty artists for most Grammy awards won in a lifetime, two are female. In the category of most Grammys won by a producer, one out of the top eleven listed is a woman. Similarly, only one out of the top thirteen Rap Grammy award winners is female. Compared to the twenty-four awards won by the two artists tied for first place, Kanye West and Jay-Z, Lauryn Hill holds only eight.[8] In a groundbreaking 2023 study done by the USC Annenberg School for Communication and Journalism, the gender, race, and ethnicity of the artists, songwriters and producers of 1,100 popular songs spanning from 2012 to 2022 was analyzed. The statistics found in this study go far beyond award winners; rather, they analyzed the percentage of women, people of color, and women of color present in the music industry as artists, producers, and songwriters. In 2016, the year Taylor Swift became the first woman to win Album of the Year twice, women made up 28.1% of the total number of artists across 1,100 songs. That number dipped to 16.8% in 2017, and in the final year of the study, women made up 30%.[9] Male producers also dominate the field, outnumbering women 34.1 to 1, and for songwriters, only 12.8% are women.[9] For women of color, the numbers are even more staggering; from 2012 to 2022, only 13 out of 1,756 producing credits went to women of color, or 0.7%.[9] This significant disparity in representation underscores the exigence that Taylor Swift confronts in her speech.

As a woman in music, Swift herself not only needed to overcome the daunting statistics about the success of women in her chosen field, but she also had to become a role model for others looking to follow in her footsteps. The "imperfection marked by urgency…[the] thing [that] is other than it should be" is the lack of female voices in music.[5] Although in her article *Silence: A Rhetorical Art for Resisting Disciplines*, Glenn writes about two prominent women in politics who were silenced by "powerful political (mostly white) males," her powerful words can be applied to music as well.[3] She argues that silence, when forcibly imposed, "shuts" women "out of any rhetorical situation", rendering them unable to speak, without an audience, and with no opportunity to "tell [their] story".[3] Historically, the increase of diversity has brought incredible advancements. Atlantic Records, a record label that has signed famous musicians like Aretha Franklin, Led Zeppelin, Bruno Mars and Ed Sheeran, was co-founded by Miriam Abramson.[10] The first female executive in music history, Francis Preston, president of BMI (Broadcast Music, Inc.), was a champion for songwriters' rights and she played a key role in getting the Copyright Amendments Act of 1992 passed.[11] All this to say, the lack of women in music is a pressing issue, and solving it is imperative to the continued progression of both women's rights and the success of the music industry. As a woman in music herself, Taylor Swift is responding to this need through rhetoric.

However, for an exigence to mark a rhetorical situation, it must be solvable through rhetorical discourse. Can rhetoric increase the number of women in the music industry? Arguably, it has at least inspired many. 25-year-old Sabrina Carpenter, a pop singer who has released several albums, including *Short N' Sweet* which charted at number one on the Billboard Top Album Sales Chart, stated that Taylor Swift "is one of [her] main inspirations ever since [she] was a little girl".[12] Gracie Abrams, a singer-songwriter who has covered several of Swift's songs, said in a Teen Vogue interview, "I just respect the s–t out of her with everything that she does. I've always been so inspired at every stage of my life as a fan of hers".[12] Dozens of other artists, including Phoebe Bridgers, Maisie Peters, and Clairo have made similar statements. The gradual increase of women artists in the music industry can't be attributed to one woman alone. However, with up-and-coming female artists citing Taylor Swift as their inspirations, Swift's ability to drive the industry cannot be overstated. As Gwendolyn Pough eloquently argues, "The span and scope of what we do and what we can do with language is wider than many of us imagine. The skills we bring as those who *do* language are needed in the world now more than ever".[1] Through the rhetoric present in Swift's actions, song lyrics, and speeches, she has responded to a rhetorical exigence.

The audience

"I want to say to all the young women out there… ".[7]

In January 2017, one year after Taylor Swift gave her Album of the Year acceptance speech, the Grammys released a YouTube video titled *It Was You | Believe in Music*.[13] This video included young girls of different ages and ethnicities reciting the lines of Swift's speech while acting, singing, playing instruments, dancing, and playing sports. This video is a perfect reflection of Taylor Swift's rhetorical audience. While the 2016 speech was given in front of an audience that consisted of men and women already pursuing careers in the music industry, her rhetorical audience was much larger than those in attendance at the Grammy awards. The people who can change the exigence, those in a position to increase the number of women in music, are young girls themselves. Taylor Swift used rhetoric to persuade young women to act on their dreams – to pick up an instrument, take dance lessons, make music videos, direct, and sing. Through the rhetoric present in both her words and her actions, Swift reached out to young women and their parents, teachers, and coaches, to remind them that they alone have the power to reshape the music industry.

The constraints

"There are going to be people along the way who will try to undercut your success or take credit for your accomplishments or your fame. But if you just focus on the work and you don't let those people sidetrack you, someday when you get where you're going, you will know it was you and the people who love you who put you there, and that will be the greatest feeling in the world".[7]

The constraints for Swift's rhetorical situation begin back in 2009, when she was awarded Best Female Video at the 2009 MTV Video Music Awards. During her acceptance speech, Kanye West climbed the stage uninvited, grabbed the microphone away from Swift, and announced to the almost nine million in-person and online viewers that he believed Beyoncé should have won. [14] "Yo, Taylor, I'm really happy for you, I'ma let you finish, but Beyoncé had one of the best videos of all time".[15] Even though the crowd reacted in shock and disapproved of West's actions by booing the singer, Swift later commented that "It was so echo-y in there. At the time, I didn't know they were booing him doing that. I thought they were booing me".[16] West later apologized and the event was moved onto pop culture's backburner until February 2016, weeks before the Grammys. On February 9, West debuted his song *Famous* with one line from the song directly referencing Taylor Swift. "I feel like me and Taylor might still have s-x / Why? I made that b—h famous".[17] Shortly after the Grammys, an accompanying music video was released that included a shot of a naked Taylor Swift mannequin lying in bed with mannequins of other celebrities including Donald Trump, Bill Cosby, George W. Bush, and Rihanna.[15] Taylor Swift condemned Kanye West, as did her fans and friends, stating that she had no prior knowledge of the line calling her "that b—h". Shortly after, Kim Kardashian released an edited phone call between Swift and West allegedly stating the opposite – Taylor Swift can be heard agreeing to at least the line about s-x. Swift argued that nowhere in the clip is she agreeing to any specific words, but the internet used the phone call as irrefutable evidence that Swift was lying, and she quickly found herself "canceled" – a term here meaning "the act of using mob pressure to harass or 'expose' someone online for any past or present drama, no matter how insignificant it may be".[18] Swarths of negative articles, like *Why Taylor Swift Really Kind Of Sucks* and *Hey, Has Anybody Noticed That Taylor Swift Can't Sing*, were published in the years between 2009 and 2016.[19,20] Writers called her "one of the biggest drama queens of the entire planet" and accused her of "promot[ing] slut-shaming".[19,21] Andrea Lampros, a HuffPost contributor, published a "parenting regret" opinion piece in which she urged mothers of young girls to think twice about taking them to Taylor Swift concerts unless they want to expose their daughters to Swift's message to "be pretty, be conventional, be quiet, and definitely put on some lipstick".[22]

Amid public backlash, loss of friendships, and demeaning and derogatory comments, Taylor Swift became the first woman to win Album of the Year twice. In an interview with Laura Snapes from the Guardian, Taylor Swift said in response to her tumultuous journey, "you can either stand there and let the wave crash into you, and you can try as hard as you can to fight something that's more powerful and bigger than you, or you can dive under the water, hold your breath, wait for it to pass and while you're down there, try to learn something".[16] The "something" that Swift learned is present in her 2016 acceptance speech.

Lines like "there are going to be people along the way" draw direct attention to Swift's public controversy, and the words "take credit for your accomplishments or your fame" cite specifically Kanye West's song *Famous*.[7] However, as she acknowledges these constraints, she transforms a moment where she was forcibly silenced into one of "resistance" and "creation".[3]

The constraints Swift mentions are things she cannot ignore. They are present in the minds of her intended rhetorical audience, in the media, and are reflected in her own actions. To produce an effective rhetorical argument, she must acknowledge those constraints, and in her speech, she uses them to her advantage by lending herself and her achievement integrity.

There are also constraints that are not directly present in Swift's words, but that still affect how she speaks. Taylor Swift uses the word "woman" twice in her speech; by doing so, she is removing any misinterpretation of who she is speaking to and what she is speaking about. In speaking to a rhetorical audience of young women, Swift is acknowledging the constraints of the number of female artists present in the music industry, the statistical ability of those women who do pursue music to succeed in it, and the historical achievements of women who have reached elite levels of fame. She is also responding to the stereotyping and objectification of women through social media and popular culture. Santoniccolo found that "exposure to stereotyping representations appears to strengthen beliefs in gender stereotypes and endorsement of gender role norms as well as fostering sexism, harassment and violence in men and stifling career-related ambitions in women".[23] Through considering this specific constraint on her audience, in lines like "people who will try to undercut your success or take credit for your accomplishments", Swift encourages the young women in her audience to overcome these moments of stereotyping, sexism, and harassment to "get where you're going".[7]

Swift also needed to consider how her message was being literally received. Less than 500 people attend the Grammys in person every year, but in 2016, 27 million people (globally) watched the televised version.[24] Taylor Swift gained 121,000 new followers on Instagram and 67,000 on Twitter as a result of the night, and a photo taken of Swift and Selena Gomez was liked 2 million times.[24] While only a small percentage of her intended audience may have been watching the live version, there were 53 million total interactions related to the Grammys on Instagram alone.[24] Swift's use of the Grammys as the platform she used to execute her rhetorical speech was incredibly strategic; there may have been no other moment in which her words would have reached as many people as they did.

There are also constraints regarding the format of her speech. In a Vogue article, published in 2024, Nian Fish laid out several rules regarding acceptance speeches. They must be brief – no longer than a minute and a half and revolve centrally around gratitude.[25] Swift had to find a way to speak meaningfully, but within the guidelines. Deviations from those unwritten rules are not usually well-received. For example, in an article published by Larry Dobrow titled *10 Worst Award Acceptance Speeches*, Gwyneth Paltrow was criticized for her Best Actress Acceptance Speech. "Over the course of [sic] 365 (!) words, Paltrow individually thanked every person she'd ever met, alive or dead. By the time she got around to thanking her grandfather, the faces of audience members had long since frozen in a collective cringe".[26] It is also worth noting that 6 of the 10 of the artists listed in that article are women. The constraints Swift operates within may be influenced by gender bias that could expose women to harsher scrutiny than their male counterparts.

What makes Taylor Swift's rhetorical speech so effective is that she navigated all these constraints perfectly. Public Response was overwhelmingly positive with articles calling her speech "an unapologetic feminist moment", "[a] swipe at industry sexism", and "empowering" (LA Times).[27,28,29] The YouTube video of her speech, published on the Grammys page, has 6.1 million views, and the *It was You | Believe In Music* version has 400,000 views. As stated above, almost 200,000 people followed Taylor Swift due to her Grammy speech. Swift's rhetoric not only resonated in the moment, but it also left a lasting impression, sparking conversations and inspiring action long after February 2016.

Conclusion

In Stacy Smith's January 2024 edition of the yearly *Inclusion in the Recording Studio?* report co-sponsored by the USC Annenberg Inclusion Initiative and Spotify, she reports that "the percentage of women artists reached 35%, a 12-year high that reflects two consecutive years of change on the charts".[30] For the first time in 12 years, the percentage of women songwriters also increased "from 14.1% in 2022 to 19.5% in 2023".[30] Smith argues that these increases are "doubtlessly due to the work of numerous groups working to support women in music. This advocacy and activism is propelling change in the industry".[30] While these incredible changes can't be attributed to the work of one woman, Swift's words have undeniably impacted the lives of many. Among the thousands of comments on It was You | Believe In Music, women from across the globe thank Swift for not only her speech, but for being an incredible role model. User @amsaric writes, "leave it to Taylor to say one of the most inspirational speeches for little girls and all women out there", and @Moonrosegirl adds, "thank you for being my role model growing up. Thank you for writing a song for every moment I found myself living".[31,32]

Being the first is an incredibly daunting task. For decades, women, people of color, and other minorities have been held back from the starting line, but their incredible achievements inspire new generations of leaders.[33] Taylor Swift, the first woman to win Album of the Year twice in 2016 and the first *person* to win Album of the Year four times in 2024, is a product of all the women who came before her. Swift herself has named several female artists as her inspirations including Joni Mitchell, a receiver of the Grammy Lifetime Achievement Award; Shania Twain, the third-ever person to receive the Billboard Women in Music Icon Award; and the Chicks, ranked 4th for most Grammys awarded to a group. Through Swift's mastery of the rhetorical situation, she has led the way for new generations of women to follow their passions. Her 2016 Grammy Acceptance Speech empowers young women and girls to, as singer Gracie Abrams put it, "want to do better and be the best version of myself as a writer and a person".[34] The push for women in music is a slow-going battle, but improvements have been made. Of course, not all those improvements can be attributed to one speech, but as rising numbers of young women achieve fame in music and cite Taylor Swift as their motivation, the successful navigation of a rhetorical situation becomes more and more apparent.

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Collaging connectivity of the Greater Sage-Grouse

By Macey Dvorak
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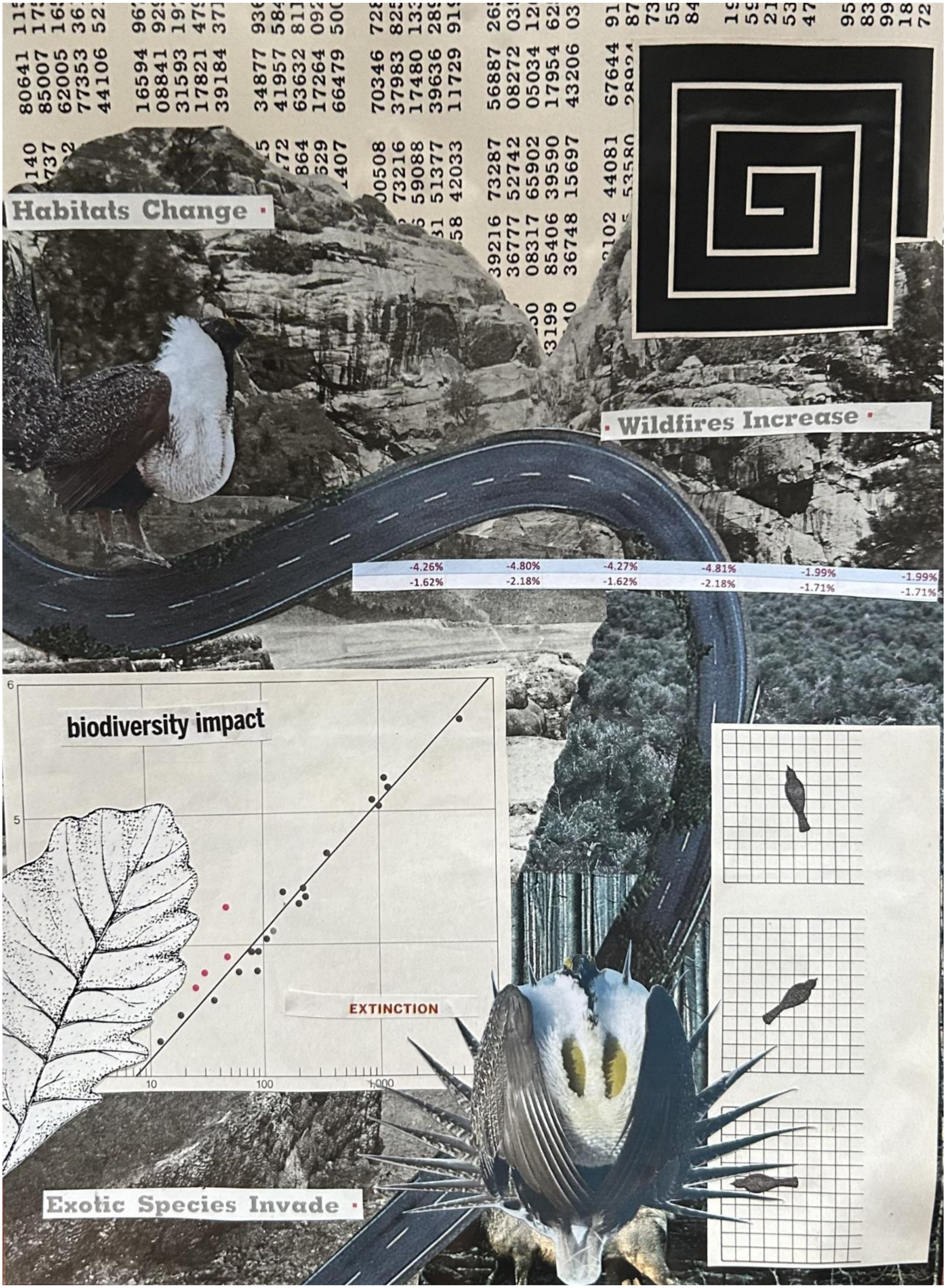
Artist's Statement

Connectivity of the Greater Sage-Grouse is important in order to sustain the health of the broader ecosystem, but to someone without a scientific background, why exactly this is important may be difficult to envision. I created a collage to communicate current status of connectivity of the species, projected change of such, and included some key impacts on why exactly this is happening. This format hopefully also would allow a different audience to understand some context of why they should care about connectivity and the Greater Sage-Grouse. Pictured in my collage is the species of interest, as well as numbers and a figure to depict the research which goes into prioritization of the species. Words seen in the piece include 'extinction,' 'biodiversity impact,' within the graph, emphasizing the cascading effect which would come with the extinction of this species. With this, 'habitats change,' 'wildfires increase,' and 'exotic species invade,' all emphasize current climatic drivers of the decreasing connectivity of the species. The road which travels throughout the collage is to show disruptors of connectivity, as often roads end up being just that, and the birds in the bottom right corner show the resulting impact, confusion, disruption, and disconnection of the species.

8.5" x 11", 2025


Habitats Change
Wildfires Increase
-4.26% -4.80% -4.27% -4.81% -1.99% -1.99%
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biodiversity impact
6
5
EXTINCTION
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Exotic Species Invade

#SugarBabies
Women's negotiation of agency and sugar culture on TikTok

By Kathryn Mae Kurlychek and Jill M. Wood, PhD
Pennsylvania State University

Abstract

The practice of sugaring or sugar dating has received greater visibility over the past decade in the U.S. as non-normative dating subcultures assert their presence with increasing frequency in digital marketspaces. As a result, markets of intimacy such as sugar dating are gaining credibility. Both the internet and social media platforms have become primary facilitators and mediators of the sugaring phenomenon. This paper analyzes of the practice of sugaring on the social media app TikTok as a potential form of girl's and women's agency. We contend that shifting expectations of healthy female sexuality, which prioritize autonomy and agency and are magnified by a neoliberalist rhetoric of choice, have contributed to the promotion of sugaring amongst young women. We review the literature on sugar dating, including a discussion of what sugar dating is and why sugar relationships have recently come under scrutiny, then discuss feminist scholarship as it pertains to women's sexuality and sugaring to examine how sugar dating is posited as empowering to young sugar babies in online spaces like TikTok. Ultimately, we suggest that the TikTok app enables girls and women to consider the practice of sugaring and to participate in sugar culture.

In 2011, the MTV hit documentary show True Life aired its 233rd episode, entitled "I'm a Sugar Baby." The series—popular for its mainstream documentation of the lives of culturally marginalized groups—used its sugar baby episode to follow three young, self-proclaimed 'sugar babies' through 44 minutes of drama and luxury. The episode was also one of the earliest instances of 'sugaring' portrayed in a mainstream media context.[1] Since then, both sugar babies and sugar daddies have appeared with increasing frequency in popular media, from episodes of Dr. Phil to BBC Documentaries.[2]

The glamorous and relatively untold world of sugaring revolves around "mutually beneficial relationships" established between older, affluent individuals (typically male) and younger persons of lower economic status (typically female).[2,3,4] "Sugaring," also known as "sugar dating," "sugar relationships," or "sugar arrangements," is a form of paid companionship wherein wealthy benefactors provide financial support in exchange for personal and social engagement. Sugaring exists on a broad continuum—from platonic exchanges to sexual relations—and often overlaps with the spheres of sex work, online dating, and hook-up culture. Today, sugaring exists in a growing pop-cultural spotlight highlighting participants' negotiation of long-standing norms regarding intimacy and sexuality.

The newfound visibility of sugar dating also exemplifies broader shifts in contemporary understandings of normative relationships, particularly in the context of late-stage capitalism. Feminist scholars and researchers like Rocío Palomeque Recio, Laina Y. Bay-Cheng, and Sharon Lamb previously argued that late capitalist ideologies, such as neoliberalism—which is characterized by an emphasis on individual autonomy, market rationality, and the privatization of social life—play a crucial role in impacting modern constructions of female sexuality.[4,5,6] As neoliberal principles increasingly shape socioeconomic spaces, intimate and relational practices have become deeply entangled with market logics. Within this neoliberal framework, the commercialization of sex and intimacy becomes not only more prevalent, but also increasingly normalized.[7] These changing perceptions of which relational expressions are appropriate and normal, fuel both growing industries of sexual commerce and society's willingness to participate in such institutions. From this perspective, romantic and sexual relationships are increasingly negotiated through transactional terms, blurring the boundaries between emotional connection and economic exchange.

Given the current socioeconomic and cultural conditions of the U.S. society, markets of intimacy—such as those indulged by the practice of sugaring—are unsurprisingly gaining wider credibility. As subversive dating subcultures assert their presence with greater frequency, websites and social media platforms alike have emerged to facilitate and mediate the sugaring phenomenon. One prominent platform is the video-sharing application TikTok, which surged in mainstream popularity during the COVID-19 lockdowns in the spring of 2020. The app, however, had already gained significant traction among many adolescents and young adults prior to the pandemic.[8] To date, TikTok hosts a global user base of over 1.59 billion people, accommodating a wide array of digital subcultures and niche communities.[9]

Since 2021, TikTok experienced a significant rise in the popularity of sugar dating among its users. Financial instability among young female users is one of many contributions to a growing interest in sugaring on the platform, an act often touted as a fun and low-committal way to earn extra cash.[10] A niche subculture on the app, dubbed "Sugar Baby TikTok," was developed to harbor such engagement; this enables a community of predominantly young, female-identifying users to share knowledge, personal experiences, and advice surrounding sugar dating. As of March 2025, the hashtags #sugarbaby and #sugarbabytiktok surpassed 284.7K posts and 91.6K posts on TikTok, respectively.

This paper examines how TikTok facilitates and normalizes the practice of sugar dating by positioning it within a neoliberal framework that prioritizes female agency, autonomy, and empowerment. By analyzing the app's content and cultural discourse, we argue shifting expectations of female sexuality—amplified by digital platforms—contribute to the increasing visibility and appeal of sugar culture among young women. In the following analysis, we review the literature on sugar dating, including a discussion of what sugar dating is and why sugar relationships have recently come under scrutiny. We further consider girls' and women's sexual agency against feminist scholarship as it pertains to sugaring, to examine how sugar dating is posited as empowering—especially to young sugar babies in online spaces like TikTok.

Sugaring & sugar culture

The most basic representation of sugar dating is a relationship trend in which financial compensation is exchanged for dating and companionship. Yet, the "sugar dating" phenomenon is riddled with complexities.[3] Sugar relationships often occur between an affluent older man and a young woman with stricter financial means, wherein the woman's companionship is exchanged for financial support. Largely heterosexual in practice, the male provider—aka the "sugar daddy"—supports his dependent "sugar baby" via cash allowances that can range as high as $1,000 to $5,000 per month. These relationships often include the proliferation of other lavish gifts, such as expensive meals, vacations, luxury clothing items, or jewelry.[2,12]

At first glance, sugar dating may appear wholly transactional. Indeed, the compensatory nature has positioned sugaring within a broader sex work debate—like sex work, much of the research surrounding sugaring frames it as an "exploitative" and "disempowering" social problem.[13] However, the realities of sugar dating are far more nuanced. Existing research on sugar dating reveals sugar relationships comprise many variants of companionship, most of which do not legally qualify as prostitution.[13,14,15] For example, many sugar babies do not engage in sexual conduct with their sugar daddies until (or unless) a romantic connection has been established.[15]

In Jacqueline Motyl's study, sugar arrangements were grouped into three distance categories: while "category one" arrangements generally consisted of an exchange of sex for money, categories two and three involved "high levels of companionship," which obscured the boundaries between sex work and traditional relationships.[15] The establishment of emotional intimacy as a condition for sexual relations uniquely locates these types of arrangements beyond the realm of brief, transactional sex. Similarly, Maren T. Scull typified sugar relationships as "unique relational packages" that are highly tailored to the wants and needs of those involved.[14] While these arrangements sometimes do resemble overt sex work, the study identifies six other categories of sugar relationships: compensated dating, compensated companionship, sugar dating, sugar friendships, sugar friendships with sexual benefits, and pragmatic love.

A number of these variants included or even required the sugar baby to provide their benefactor with "the girlfriend experience" (GFE), which encompasses the sharing of quality time, traditional-style dates, and sometimes sex. To this end, many participants involved in sugar arrangements (outside of sugar prostitution) stress emotional connection as a prerequisite for sexual interaction and emphasize consent in instances of sex acts.[14] At the same time, Scull's research revealed most sugar daters acknowledged sex as a crucial part of the relationship arrangement. Expectations for emotional intimacy across all types of sugaring arrangements can be varied, as many sugar daters are either non-monogamous or wish to maintain discretion around their involvement in sugaring. In this way, sugar arrangements again blur boundaries between prostitution, escort work, and more acceptable iterations of dating culture such as "hooking up" and non-monogamy.

Popularly described as mutually beneficial, sugaring boasts benefits beyond compensation and attention. While financial support remains of primary importance to sugar babies, many women also seek companionship, friendship, and even mentorship from a sugar daddy.[12] Given that sugar dating is popularly marketed to college-aged women—or women between the ages of 18 to 26—the opportunity to gain career-related knowledge presents a powerful draw for many. In fact, a notorious sugar dating website, *Seeking.com*, campaigns specifically to a female-identifying college student demographic by offering free premium memberships to anyone who enrolls using a college email address. As of 2021, *Seeking.com* amassed a user base of over 11 million college-aged sugar babies, with more than 8 million identifying as female.[16]

Within this context, Srushti Upadhyay unsurprisingly found many sugar babies desired professional mentorship from their sugar daddies.[17] By sampling a pool of public profiles available on Seeking.com, the study revealed several potential incentives for sugaring among both sugar daddies and sugar babies. Specifically, the study shows 40% of sugar baby profiles sought mentorship and career guidance from their sugar daddies. Some users even perceived sugar daddies as a potential networking source.[17] One profile indicated a desire for "the relationship to be professional/friendly while learning and experiencing new things together."[17] Another expressed interest in "drama-free stability and guidance."[17] Clearly, the perceived experience possessed by wealthy male sugar daddies appeals to young women emerging into the job market.

In turn, the sugar daddies included in Upadhyay's study expressed the desire to serve as advisors to their sugar babies, reaffirming the idea that sugar daddies desire relationships outside of or beyond transactional sex. Indeed, companionship and the "GFE" are frequently the impetus for sugar daddies to seek sugar arrangements. Many career-driven sugar daddies confront feelings of loneliness as a result of their profession, which may demand regular travel or time-consuming commitments.[17] The emotional support provided by sugar babies in these instances eases the burden. In many ways, the benefit of sugar arrangements for sugar daddies mimics normalized relationship ideals wherein women provide emotional assistance to their male partners. Unlike typical relationships, however, physical and emotional comfort are the commodities for which he is paying and are expected to be readily provided at the sugar daddy's request.

The expectations sugar daddies and sugar babies have for their arrangements are typically expressed at the outset. Contractual agreements are negotiated in the first few meetings between a sugar daddy and a sugar baby. These meetings, sometimes called "pot" meetings (short for potential), serve the dual purpose of establishing both expectations and mutual "chemistry" among parties.[13,17] Further, these meetings affirm the importance of emotional connection to the overall success of a sugaring arrangement. The arrangement may also address an agreed-upon length for the relationship, the frequency of contact, or the amount of money exchanged per meeting.[12]

Ultimately, sugaring operates at the intersection of dating cultures—including traditional dating and hook-up culture, and modern-day sex work. This occupation of a liminal space allows sugar daters to uniquely define the facts of their arrangements. As a form of paid intimacy, sugar dating is both emotional and economic, positioning sugar daters as empowered agents in mutually beneficial relationships. Shared emphases on chemistry, emotional intimacy, and consent enable sugar daters to maintain a certain distance from stigmas associated with traditional sex work—stigmas often framed as socially deviant or, in much of feminist discourse, as a threat to women's rights and bodily autonomy. Although sugar relationships can fall into several different categories, certain themes generally transcend most variations. These themes include an arrangement that is mutually beneficial, a desire for genuine connection or emotional intimacy between partners, and the exchange of money for companionship. These general norms help shape a broader "sugar culture" in which sugar daters participate.

Sugar culture is the contextual backdrop for sugar relationships, or offers a point of reference and support for both sugar daddies and sugar babies. Modern sugar culture is often characterized by the circulation of rules, tips and tricks, and even online advice. Chat forums, such as Seeking.com's *LetsTalkSugar* and FundMySugarBaby.com's *SugarDating Forum*, provide opportunities for sugar daddies and sugar babies alike to connect with one another and share their experiences with sugar dating. Sites like these circulate norms and proffer advice to individuals new to the culture. Similarly, popular media has picked up on the sugar dating phenomenon, with news pieces in magazines like *Cosmopolitan*, *Vice*, and even *Business Insider* circulating recounts of real-life sugar dating experiences.[3] As sugar dating gains traction among young women as a viable source of income, sugar culture has gradually taken up more space in online and everyday discourse. However, this recent rise in visibility calls for consideration of a broader historical and socioeconomic context that played a significant role in crafting the norms of contemporary sugar dating.

The negotiation of intimacy in a market context is hardly novel. Indeed, notions of the "kept" woman or "mistress"—women who are provided for in secret by a wealthy man—have existed for centuries and are closely associated with modern iterations of sugaring.[3] Scholars have suggested that the specific term "sugar daddy" originated in the early 1900s, when the heir to the Spreckels Sugar Company, Adolph Spreckels, married socialite Alma De Brettville, who was "24 years his junior."[3] Despite historical stigmatization toward the "kept" women (and the wealthy men who supported them), global industrial change and the liberalizing attitudes that followed ultimately reshaped traditional values around relationships—namely, through the creation of the sex industry.

In a 2010 study, Brents & Sanders argued that neoliberalizing policies—which aimed to enhance consumer freedom and emphasize individual choice—extended beyond the economic realm to influence the regulation of morality and sexuality.[18] According to their analysis, the sex industry's integration into mainstream social and economic life is the product of "late-capitalist mass consumption," which encourages individualist and egalitarian attitudes under the guise of market freedom.[4,18] State regulation and intervention gave way to neoliberal ideals, enabling the sex industry to be reimagined as a legitimate site of entrepreneurial opportunity and consumer choice, facilitating its expansion into a multi-billion-dollar global enterprise.

As economic attitudes around sex and intimacy liberalized to match pace with market demand, social institutions similarly detached from more traditional values pertaining to sexuality and relationships. The body became accepted as a commodity; increasingly available and thus increasingly disposable. The freedom of choice for consumers to use or dispose of this commodity was emphasized as an economic imperative—so much so that the commodity itself (particularly the female body) became irrelevant.

Interestingly, sugar daters—especially sugar babies—often employ ideas of agency and choice rhetoric as a central means to distinguish their relationships from participation in the sex work industry. In this way, neoliberal ideals surrounding commodification of intimacy and the body are essential to the construction of sugar relationships. Sugar daters, and particularly sugar babies, feel empowered to commodify themselves for financial gain. These nuanced realities of sugar arrangements make it difficult to generalize the phenomenon as wholly deviant. Furthermore, the complexities in sugaring relationships confound the ability to demarcate the structures of power and levels of agency available to individuals in sugar arrangements.

How do sugar babies negotiate agency in sugar relationships?

An individual's ability, or perceived ability, to act autonomously is central to the notion of empowerment. In the instance of sugaring, sugar daters—particularly sugar babies—are often portrayed as having unbridled agency in negotiating the terms of their relationships. Popular media also plays a key role in framing sugar dating as empowering, with narratives that emphasize personal agency and financial reward encouraging scores of would-be sugar babies to consider entering arrangements themselves.[19] Centering choice rhetoric in conversations about sugar dating presents the practice as economically liberating and perhaps sexually empowering for young women.

While modern trends in sugaring might be new, questions of women's sexual agency, empowerment, and oppression in relationships with men are not. Following the "feminist sex wars" in the 1980s, feminist scholars and thinkers questioned women's ability to be embodied subjects in sexual relationships with men. During this period, feminists were deeply divided over the emerging sex industry, from pornography to BDSM. Some argued such practices reinforced hegemonic heterosexual power structures, while others defended them as potential sites of women's sexual autonomy and expression. For instance, Catharine MacKinnon and Andrea Dworkin contended that heterosexual sex under patriarchy was inherently coercive, arguing women's consent is compromised by structural domination.[20,21] In contrast, sex-positive feminists such as Gayle Rubin and Carole Vance emphasized the need to acknowledge the complexity of sexual experiences.[22,23] A persistent question arose during these debates: can women exercise true sexual agency within systems structured by gendered inequality? Contemporary practices like sugar dating reignite this unresolved tension, compelling scholars and participants alike to consider how—and if—choice and consent can be evaluated separately from broader socioeconomic constraints.

More recently, feminist sexologists have theorized about girls' and women's ability to embody their sexual desire with regards to sexual agency, objectification, and sexual stigma. Such stigma suggests female sexuality is primarily for male pleasure and girls and women should be virtuous. Young girls and women are traditionally discouraged from outward expressions of sexuality, often by health and sex education courses reinforcing the notion that sex is dangerous for women.[7] This socially enforced suppression of female sexuality is characteristic of patriarchal society. To address the patriarchal control of women's bodies, feminist scholars theorize definitions of agency in girl's and women's sexuality, including sexual desire, subjectivity, and pleasure.[7,8]

Feminist scholar Sharon Lamb connects sexual desire, subjectivity, and pleasure to the importance of girls' and women's bodily autonomy in sexual experiences. Lamb explains historically "problematic" areas for women's sexual expression, including objectification, abuse and victimization, and expectations for female passivity are all rooted in a lack of agency.[7] By emphasizing sexual desire, defined as the embodiment of sexual feelings, girls and women are empowered to reclaim pleasure in sexual encounters outside of simply "giving someone else pleasure through their bodies or performances."[7]

Similarly, sexual subjectivity—described as a position opposite female sexual objectification, wherein women act as a sexual agent—empowers women to pursue their own desires. The framing of women's sexuality as agentic depends on affirming their sexual and bodily autonomy. In recent years, feminist efforts to reclaim and affirm female sexual agency have gained new visibility alongside the growing influence of neoliberal ideologies within social and economic institutions.

In this context, no longer is female sexuality construed merely in "reactive" terms to "male overtures."[7] Rather, sexual agency has become an important new gauge in assessments of female sexuality. This paradigm shift has unsurprisingly showcased women's sexual power, centering desire, choice, and self-interest in girl's and women's sexual expression. Liberalizing attitudes contributed to the social acceptability of non-traditional relationships (such as same-gender and polyamorous relationships), creating space for new iterations of sexual expression.[1]

Scholarly feminist work supports the notion that neoliberalism's ideals of choice and personal agency shape social conceptions of appropriate sexual behavior.[24] Scholars have argued that perceptions of agency may differ across age groups, and that distinct developmental periods among adolescent girls and young women have marked differences in what is considered sexually normal and appropriate, and therefore require separate considerations.[7,8,24,25] As an example, "sexual agency" for an adolescent girl in the process of forming an understanding of and relationship to her own sexuality differs greatly compared to midlife women.

Evaluation of feminist scholarship on girls' and women's sexual agency is critical to understanding the practice of sugaring. The scripts and associated norms of sugar culture construct choice and agency as tenets of sugar dating, enabling sugar babies "[to] be acknowledged as agents and granted all due respect for their freedom of sexual choice."[6] The subjective nature of agency provides women with the opportunity to control (to varying degrees) the outward perceptions of their sexual conduct in order to position themselves within an empowered light. An emphasis on choice and agency—without context as dichotomous concepts—allows sugar babies to create a narrative that not only validates sugaring relationships but also posits their participation as empowering.

Arguably, such neoliberal constructions of agency and choice are illusory. Neoliberal systems of rhetorical defenses outwardly prize and promote individuality, personal responsibility, and choice. However, such defenses ignore systemic and structural power imbalances and oppression in sugaring relationships. The perilous state of women's access to reproductive and sexual health choices, the dependence of youth on systems which inhibit their personal freedom and expression, and institutionalized racism, sexism, and classism are all magnified under a neoliberal perspective. Therefore, despite the many sugar babies who insist sugaring empowers them, sugar arrangements actually limit sexual expression for many girls and women.

To this point, a 2022 study examines how sugar dating often blurs the lines between intimacy and exchange. Through qualitative interviews with four active sugar babies in the U.K., Recio highlights how many sugar babies accept sexual acts implicitly as "part of the deal."[5] Indeed, Recio notes it was "[a] recurring point through the interviews" that participants felt obligated to "comply with a sexual script for the relationship to work," revealing the gendered dynamics and emotional labor embedded in these transactions.[5]

In the same study, Recio also asserts that the language used to describe sugaring on Seeking.com markets different "norms" to sugar babies and sugar daddies, creating a discrepancy in the expectations each party held for sugar arrangements. For sugar babies, arrangements were a mechanism of "economic relief" while, for sugar daddies, the focus was on building a relationship.[5] This discrepancy led to conflict between the sugar babies and sugar daddies—the latter of whom, in Recio's findings, were more reluctant to hold up their end of the deal.

Recio's findings conflict with the popular sugaring narrative that sugar babies have equal or superior control in sugar arrangements, as their ability to set the terms "can be constrained by their economic context."[5] Her study underscores the ways in which power and agency are negotiated not simply through explicit transactions, but through the unspoken norms that structure expectations for the relationship. While sugar babies may exercise strategic decision-making by pursuing financial support from a sugar daddy, their agency is exercised within a limited framework shaped by market logics, social expectations, and the economic power maintained by sugar daddies.

Although Recio's participants often described feeling constrained by the implied sexual scripts of their sugar arrangements—particularly those who identified as financially dependent on them—a more recent study by Scull reveals nuance within these so-called sexual scripts.[13] Like Recio, Scull conducted qualitative interviews with sugar babies, but her broader sample of 48 U.S.-based participants offered more diverse accounts of power, agency, and control. Notably, 60% of Scull's participants revealed they had participated in some form of sex act with a benefactor; of these, 83% indicated feeling "in control" of these situations, leading to feelings of excitement and empowerment.[13] Many of Scull's participants described these interactions not as coercive, but as opportunities to assert sexual autonomy and gain financial leverage.

Additionally, unlike the U.K. sugar babies included in Recio's study—who often had to repeatedly assert boundaries to receive money from their benefactors—some of the U.S. sugar babies surveyed by Scull described receiving gifts, allowances, and other payments from their sugar daddies despite not engaging in any sexual activity. In these cases, sugar babies expressed high feelings of empowerment and control, as they were more freely able to negotiate the terms of their relationships by setting boundaries around physical intimacy without compromising their material benefit. It is important to note, however, that many of these participants did not consider themselves financially dependent on their sugar arrangements, further complicating narratives of agency along class lines.

The fact that the normalization of sex work has enabled sugar daters to gain legitimacy in contemporary economy makes it once again difficult to parse out the differences between sugar arrangements and more explicit forms of sex work. While sugaring may be framed as consensual and empowering, it remains deeply embedded in the context of patriarchal power structures and economic inequality. Choice rhetoric obscures dynamics of power inherent to paid labor, thereby sustaining economic inequities under the guise of free will. In reality, these relationships often reinforce the same gendered disparities that they claim to subvert—making it impossible to divorce from the broader discourse on sex work. As such, sugaring must be recognized not as a distinct or empowering alternative to sex work, but as a reflection of the complex and often exploitative intersection of sexual labor and capitalist markets.

Perceptions of sugaring online and in social media

To understand sugar dating's current popularity, one must first consider how technology mediates intimacy and sexual commerce. Since the launch of online dating sites at the turn of the 21st century, romance and dating culture have become increasingly digitized. [26] As an industry, online dating accrues billions of dollars annually, with websites and mobile applications pandering to all dating niches. As digital spaces embrace markets of intimacy, sites for arranging sugaring relationships increased in number.[26,27]

The first-ever sugar dating website launched in 2006 under the domain *SeekingArrangement.com* and saw instantaneous success. Since this time, dozens of platforms have surfaced within a digital market space; however, *SeekingArranagement* (now simply under the domain "Seeking.com") remains at the forefront of modern sugaring relationships and discourse. To date, the site boasts over 52 million members worldwide with a ratio of eight sugar babies available per single sugar daddy.[16]

In addition to websites such as *Seeking*, which directly facilitates the formation of sugar arrangements, other social media platforms have gradually joined in on the promotion and normalization of these relationships. Indeed, social media sites have begun to accommodate new and overlapping concepts of sugaring in the past decade. The social media app TikTok is perhaps the most compelling of these platforms, because its sugar baby subculture advocates sugaring to a wide and generalized audience—the majority of TikTok users are adolescent girls and young women.

The inclusion of sugar culture on TikTok has the potential to introduce sugaring to girls and young women who otherwise might remain unaware of these types of relationships, in a manner that both normalizes and encourages their participation in sugaring as an economically and sexually liberating path to independence and success. To further explore how sugar dating is marketed and normalized, this section compares Seeking.com and TikTok—two separate but influential platforms—in their promotion of sugaring to young women.

Seeking.com

Founder and CEO of Seeking.com Brandon Wade felt inspired to start the website as a solution to his own problems. Wade self-described his character as "nerdy," lacking in both experience and perceived appeal to women.[28] Wade developed SeekingArrangement.com (now simply known as Seeking.com) to attract women based on what he felt could make him stand apart from other men: his money.[2]

The Seeking website describes itself as "the leading Sugar Daddy dating site where over 20 million members fuel mutually beneficial relationships on their terms."[16] The notion that Seeking.com enables users to create relationships "on their own terms" saturates the site's registration and informational pages as well as their marketing strategy. *Seeking*'s registration page also features links to the site's popular media coverage, including articles published in *The Wall Street Journal, Business Insider, and The New York Times*.[16,2]

Seeking.com functions like a dating website, similar in format to platforms like eHarmony or Match.com. Users of the site can create dating profiles that display basic identity markers—such as age, occupation, and general location—and allows users to include a description of the type of arrangement they are seeking. Profiles are rife with sugar culture "lingo," from pleas for mentorship to an emphasis on emotional connection. Sugar daddies and babies can interact on Seeking.com by viewing and favoriting one another's profiles. The website also features an inbox that enables users to send direct messages.

Following its inception, *Seeking* quickly gained public attention. Despite carefully constructed guidelines that prohibit using the site to solicit prostitution or escort services, Seeking still received critical backlash for its promotion of transactional relationships. At one time, Wade even experienced denunciation as a "pimp" in media coverage for his role in facilitating "the sale of women's bodies."[3]

The comment came in direct response to Seeking.com's overt marketing strategy, which directly appeals to young girls and women in need of financial relief. To this end, Seeking.com's "Sugar Baby University" was launched in 2011 as a campaign to college women struggling with financial debt as a byproduct of educational loans. In an attempt to attract a female college demographic, Seeking.com continues to offer free premium memberships for anyone who registers with a ".edu" email address.[15] The "Sugar Baby University" homepage also features a running debt clock of student debt in the USA, as well as the top colleges for sugaring nationwide.[28]

Seeking.com's increased media attention continues to contribute to the growth of an online sugar culture. Within the first decade of Seeking's launch, more than one thousand online resources devoted to sugaring were created, ranging from "how-to" guides, chat forums, and eventually new sugaring platforms.[2] Seeking.com's discussion forum and blog, *LetsTalkSugar*, compiles many of these sugaring resources while also producing fresh, new content for brand-new sugar babies.

LetsTalkSugar, more commonly abbreviated to LTS by users, provides information and support for members of Seeking.com and sugar babies in general, with content divided among sub-headers such as "SUGAR 101," "NEWS," "ADVICE," "FASHION," and more. LTS's homepage offers glamorous glimpses into the world of sugaring, with photos of diverse young women and shirtless, silver-haired men attached to articles with titles like "4 Things to Perfect on Your First Date with a Potential Sugar Daddy," and "Getting to Daddy's Heart Through His Stomach." The blog also features a host of resources reiterating the empowering benefits of sugaring, including a 2019 advice piece titled "How Feminists Can Capitalize in an Arrangement."[29]

While *Seeking* is a platform created specifically for users to arrange sugaring relationships, the proliferation of sugar culture has contributed to the promotion of sugaring on other social media sites, such as TikTok.

TikTok

The mobile application TikTok gained mainstream recognition during the height of the COVID-19 lockdowns in the spring of 2020. The video sharing app, owned by Chinese company ByteDance, has become the leading video-sharing app globally, with over 170 million users in the U.S. alone.[10] TikTok enables users to create and share short-form and long-form videos, ranging between 15 seconds to as long as 10 minutes. Videos span a wide range of genres, including dance, comedy, education, activism, and beyond. The app's algorithm tends to link videos thematically (usually by hashtags) and curates specialized content for each user's home page based on previously liked videos. In this way, users experience a variety of content in rapid succession, and receive new content based on what the predictive algorithm suggests. TikTok has seen particularly massive success among adolescents, teens, and individuals in their early twenties.[9] Indeed, TikTok's page corroborates this demographic: of its 170 million U.S. users, roughly 32% of users identify themselves between the ages of 10–19, and 29% fall between the ages of 20–29.[10] Additionally, over half of all U.S. users (roughly 60%) identify as female.[10]

While TikTok's U.S. users are primarily young women, the platform caters to a broad and diverse audience. The app's expansiveness gives rise to countless subcultural niches—often organized around specific hashtags—that reflect users' varied interests. For example, hashtags like #booktok, #foodtok, and #witchtok collect content on literary trends, cooking recipes/tutorials, and spiritual practices, respectively. These niche, digital communities foster engagement through shared content and discourse, blurring the boundaries between entertainment, education, and identity.

Accordingly, sugaring found its foothold on the app, most popularly beneath the hashtags #sugarbaby and #sugarbabytiktok. A TikTok user could find and follow these hashtags without necessarily seeking out a sugaring arrangement; in this way, TikTok differs from the Seeking.com platform. In addition to different audiences and site purposes, TikTok's facilitation of sugaring greatly differs from that of *Seeking*'s. While *Seeking* functions specifically as a relationship-forming website to connect sugar daddies and sugar babies, TikTok does not promote a specific dating mission or form of content. Rather, the app accommodates a wide variety of topics as guided by user participation. As a result, the presence of sugaring on TikTok does not facilitate sugar dating overtly so much as it enables sugar daters to participate in a shared sugar culture.

Under the hashtag #sugarbabies, users can find content and resources created for sugar babies on the app, including videos that showcase lavish gifts and other economic benefits of sugaring. Other videos are informational, giving users an overview of sugar dating *dos and don'ts* and extending general advice on sugar dating. The popularity of content related to sugaring on TikTok has grown so significantly the niche has been dubbed "The Sugar Baby School of TikTok."[11] A *Refinery29* article by the same name draws on interviews conducted with popular sugar baby creators on TikTok, to provide insight into the growth of Sugar Baby TikTok among app users.

One such user goes by Candis and can be found on TikTok at @candiserianna. Candis originally joined Seeking.com in the fall of 2020, and subsequently created a TikTok account to chronicle her experience as a sugar baby.[11] Candis quickly found an audience on the app. At the time of writing, her account, created in December 2020, has over 11,000 followers, and her videos have a combined 47,500 likes.[30] Candis's posts function as a safe space for other sugar babies, providing advice on topics such as which sugar dating apps to use, and how to use them safely and effectively. Candis asserts that her videos are meant to empower her viewers: "Whatever you think you're worth," Candis tells us, "Add tax."[11]

Similarly, Wendi, a TikTok user with the handle @thehelpfulho was a practicing sugar baby prior to joining TikTok. Like Candis, Wendi uses her platform to spread awareness about the realities of sugar dating to an audience of over 61,000 viewers.[31] Her videos range from Q&A's to social media dating advice, to helpful know-hows for sugar babies. Wendi also stresses feelings of empowerment as bestowed by her participation in sugar dating. Candis's and Wendi's accounts are not used for creating new arrangements—rather, they participate within a larger sugar culture on TikTok that ultimately creates a space of support and community among sugar babies on the app. Sugar Baby TikTok is largely dedicated to debunking and de-mystifying the myths of sugar dating through educational videos, with a particular (and familiar) emphasis on sugaring's distance from sex work.[11]

While Sugar Baby TikTok parallels other sex-positive niches on the app, members are insistent that sexual intimacy is not required in all sugar relationships. TikTok user Wendi remains adamant in her posts that "sugar dating goes far beyond—and sometimes doesn't even include—physical intimacy."[11] In line with sugaring scripts, notions of companionship between sugar daters are particularly emphasized on her platform. Similarly, Candis has clarified in her posts that sugaring does not need involve sex.[11] Many other users who circulate advice for sugar babies maintain these declarations, identifying alternative modes of sugaring which do not necessarily include sexual intimacy, or even in-person interaction.

Although both Candis and Wendi are examples of pre-established sugar babies who joined TikTok to share their experience, a number of sugar babies on TikTok credit the app for their introduction to (and subsequent involvement in) sugar relationships, claiming their exposure to sugar culture through videos persuaded them to seek out their own arrangements. As part of her research for her article "Inside the Sugar Baby School of TikTok," author Chloe Meley posted her own video on the app, asking viewers to comment whether they had ever felt enticed to become a sugar baby as a result of TikTok. The testimonials she received—over 100 comments—were a resounding "yes." One user commented saying, "Tempted is an understatement, I think about it at least once a day"; another jokingly insisted, "girl, who hasn't?"[11]

Many comments attested that women had "gotten their start" in sugaring thanks to Sugar Baby TikTok.[11] These comments from TikTok users suggest the influence that Sugar Baby TikTok has on young women, and specifically, that sugaring is widely perceived as a viable and empowering economic decision to make, with perceived result in alleged positive experience.

However, advice and how-tos—the established staples of sugar culture—are not the only way that sugaring is promoted on TikTok. The short-video sharing format of the app means that sugar babies may also visually showcase the perks of their lifestyles. Indeed, some of the most highly viewed videos under the hashtag #sugarbaby include girls flaunting their expensive gifts, fancy dinners, vacations, or screenshots of the balance in their bank accounts. User @serenaileen, for example, shared a video titled "A Day in the Life with a Sugar Baby," wherein she documented her trips to the nail salon and mall, as paid for by her sugar daddy. Since posting, the video has accrued 1.9 million likes.[32]

Another TikTok user, @maddie.sun, shared a video of her and her friends enjoying a glamorous day spent on a yacht with a wealthy older man, set to the song "Meet Me Halfway" by the Black-Eyed Peas. The video was captioned: "when one friend has a sugar daddy we all have a sugar daddy" and amassed 3.6 million likes.[33] Displays of luxury items or enviable experiences—also known as flex culture—contribute significantly to a sugaring narrative that promises empowerment to young women through increased economic status and independence. These "flex" videos exemplify an emerging facet of sugar culture, which emphasizes identity performance as a means of attracting mainstream attention. Flex culture is not merely a display of material wealth, but an act that embraces the commodification of one's lifestyle. Through flex culture, an individual's possessions and experiences are leveraged both as means of social capital and identity performance. Sugar Baby TikTok is inundated with videos showcasing lavish gifts, luxurious spa and salon visits, and other markers of affluence framed as symbols of empowerment and independence. However, this narrative contrasts with existing research highlighting the financial dependency many sugar babies experience on their sugar daddies, which can lead to compromised boundaries and a lack of true autonomy. Yet, on TikTok, sugar babies share videos that portray sugaring as a platform for economic indulgence. This portrayal scarcely (if ever) represents the underlying power dynamics and transactional nature of sugar arrangements. Of course, many sugar baby users contend that Sugar Baby TikTok is "here not only to flex, but to teach as well."[9]

Ultimately, sugar culture on TikTok is not a far cry from the types of sugar cultures facilitated on Seeking.com or in other online spaces. However, Sugar Baby TikTok remains distinct in its presentation of information. Not only does the video formatting of the app enable a new type of visibility for sugaring—one previously inaccessible to those outside of the culture—but it also facilitates a greater sense of community and trust among practicing sugar babies and interested users. Moreover, TikTok's sugar culture is widely accessible to users of the app, either through hashtag searches or by the random appearance of sugar-baby related content on user's homepages. In addition to broadening the audience exposed to sugar culture, Sugar Baby TikTok also centers empowerment in its narrative of sugar dating. The increased exposure of sugaring through TikTok—as well as the conversations about sexual agency that Sugar Baby TikTok facilitates—play valuable roles in the normalization of sugaring and, indeed, sex work more broadly.

TikTok and perceptions of agency

While the sugar culture created on TikTok initially appears rooted in girls' and women's sexual liberation and empowerment—and less intentional in recruitment of young women than does Seeking.com—questions of women's agency persist. On the one hand, sugar babies on TikTok circulate content that advocates, through education and flex culture, both the normalization of sugaring as well as the de-stigmatization of sex work more broadly. Specifically, TikTok sugar babies posit themselves as the epitome of smart, independent, and self-sufficient young women who are both beautiful and confident enough to get what they want via sugaring relationships.

Yet, given the patriarchal context in which sugaring, TikTok, and Seeking.com all exist, it remains unclear exactly how much agency young women actually have in sugar arrangements. Both Tolman and Lamb argue that pleasure, subjectivity, and choice—elements that affirm agency—are required criteria for girls' and women's authentic sexual expression. In consideration of these criteria, one must further investigate how sugar babies negotiate their sexual agency within the unique dynamics of sugar arrangements. More research is crucial for not only understanding the lived experiences of sugar daters, but also for distinguishing sugaring from other forms of sex work.

The emphasis on sugaring not requiring sexual relations remains especially prevalent within Sugar Baby TikTok. This particular sugaring script aligns with Scull's study of U.S.-based sugar babies, many of whom experienced economic benefits from their sugar daddies even in the absence of sexual acts or encounters. More research is necessary to understand whether these similarities are the product of differing sugar cultures in the U.S. compared to other parts of the world, or if they simply reflect a broader shift in how transactional intimacy is being redefined in the digital age. The distance that sugar daters place between their arrangements and more traditional forms of sex work may even account for why TikTok sugar babies—who advertise to an audience that may contain individuals under the age of 18—are so adamant about sugaring not requiring physical intimacy.

Like previous feminist scholarship that is critical of neoliberal scripts of agency and rhetorical uses of choice as an illusory construct, questions remain regarding sugar babies' levels of bodily and sexual autonomy. Yet sexual agency is not a dichotomous concept—women negotiate sexual agency in broader the context of their relationships and lives. In this way, sugar babies may consistently negotiate their sexual agency within sugaring relationships and sugar culture.

Social media "provide[s] opportunities to assert agency and build identity narratives with redemptive themes."[34] As much as TikTok invites a close-knit community of sugar babies to come together through the sharing of videos, as a social media platform it inherently authorizes sugar babies to create and perform an identity that most suits their self-narrative. Despite the normalization that Sugar Baby TikTok has afforded sugar dating, the choices available for sugar babies continue to exist within and remain constructed by institutions that are inherently patriarchal, racist, sexist, and classist. Therefore, these negotiations of sexual agency require patriarchal bargains that nominally return sexual autonomy to sugar babies, but not completely.

Conclusion

The relatively sudden and mainstream visibility of sugaring and sugar culture follows in the wake of vast socioeconomic changes within contemporary American institutions. Specifically, practices of neoliberalism have encouraged a deregulation of market spaces and prioritized consumer choice, opening up opportunities for market expansion and legitimized sexual commerce. These economic changes have encouraged cultural shifts including the adoption of an individualist ideology.

Neoliberalist rhetoric has also come to influence personal expression and conceptions of normative behavior, particularly where female sexuality is concerned. The normalization of sex work and sugaring on TikTok is a primary example of this reality. Within a sex-positive niche on the social media app TikTok, sugar babies have found a community wherein they can showcase the perks of a sugaring lifestyle and contribute to a larger conversation which debunks stereotypical myths and stigmas surrounding the practice of sugaring. This debunking process is characteristic of sugar cultures found on other platforms: it heavily distances itself from notions of sex work, while at the same time insisting that consensual participation in sex work industries can be and often is empowering for many women.

What sets Sugar Baby TikTok apart from other sugaring platforms is its ability to visually convey information, lending to a greater sense of credibility and community among viewers in the community. Sugar Baby TikTok has seen phenomenal growth since its recent inception, engaging thousands of users and encouraging at least as many to consider adopting a sugar baby lifestyle for themselves. Young women report that their primary motivation for engaging in sugaring is the promised ability to exercise personal autonomy, choice, and independence in a relationship which deviates from normal heterosexual roles.

Though the literature on sex work and sugar dating seems divided, most scholars agree that these practices continue to unfold under patriarchal conditions that constrains women's ability to exercise true agency; even when such practices appear to offer empowerment or financial independence through the subversion of traditional gender norms, this agency is still present. The neoliberal logic embedded in platforms like Seeking.com and TikTok further complicate these dynamics, by commodifying both the body and intimacy as well as encouraging lifestyle trends and personal decision-making through highly tailored content. In this context, sugaring functions less as a challenge to patriarchy than as a negotiation within it. In a digital era, sugar babies must continue to negotiate agency through algorithmic visibility, market logics, and the ongoing cultural work of redefining intimacy and labor. While sugar babies may feel empowered in their decisions to engage in sugar arrangements, these relationships and negotiations still occur within a framework constrained by gendered inequalities, racial bias, and heteronormativity. As a result, sugar daddies continue to maintain control over the ultimate tool of power within a neoliberalist, capitalist society: money.

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