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Design Thinking in Higher Education: Opportunities and Challenges for Decolonized Learning

ABSTRACT

This article builds upon current research to understand the value and limitations of teaching and learning design thinking (DT) in higher education. We implemented a mixed-methods study with faculty and students across 23 diverse courses in four higher education institutions in the United States. Findings showed that following structured learning processes, engaging in active listening, and focusing on others' perspectives were the most valued DT practices across disciplines. In contrast, prototyping and experimentation were the least used DT practices, with widely varying understandings across disciplines. Additionally, we found consistent evidence that DT can support liberatory teaching and learning practices that decolonize students' perceptions of power, encourage situated and action-oriented empathy, and provide opportunities for co-creation. This is particularly true when faculty intentionally encourage collaboration and project framing focused on critically analyzing dominant ways of knowing and power structures. Our analysis further revealed the challenges and importance of prototyping and conducting experiments with project partners. Ultimately, this approach can significantly enhance liberatory project outcomes and facilitate decolonized learning experiences. Given our findings, we point out limitations and challenges across current DT pedagogical practices and provide recommendations for integrating DT practices across disciplines in ways that center on issues of systemic oppression, social identity, and human-environmental relationships.

KEYWORDS

design thinking (DT), pedagogy, decolonize, project-based learning (PBL), higher education

INTRODUCTION

As a pedagogy, design thinking (DT) gives students opportunities to investigate complex situations and design solutions in response to real-world issues. Since DT is a transdisciplinary, project-based approach to learning, the process requires students to move beyond "the constraints placed by monocultural perspectives or hierarchies" (Shahjahan et al. 2022, 83); it disrupts dominant modes of knowledge production and encourages students to explore alternatives to current realities.

Although prior studies have shown DT can positively impact teaching and learning within higher education (Haigh and Withell 2020; Lake, Flannery, and Kearns 2021; Lake, Lehman, and Chamberlain 2019; Lake, Motley, and Moner 2019; McLaughlin et al. 2022; Pope-Ruark, Motley, and Moner 2019), little research has explored the potential role of DT when it comes to liberatory teaching and learning praxis and philosophies (Noel 2022; Udoewa 2022). In addition, few studies analyze data

from the perspectives of faculty and student within multiple disciplines and institutions of higher education. This article seeks to extend recent research on DT pedagogies through a cross-institutional, mixed-method study[1] that critically examines the practices and outcomes of DT pedagogies. To build upon previous research (Lake, Flannery, and Kearns 2021; Liedtka, Hold, and Eldridge 2021; McLaughlin et al. 2022), we examine both faculty and student perceptions of DT courses via online surveys and semi-structured interviews. Findings allowed us to critically reflect upon the potential of DT pedagogies to encourage liberatory (i.e., decolonial and anti-oppressive) teaching and learning practices.

As a team of White and Asian able-bodied scholars who work in various disciplines of the humanities, sciences, and social sciences at different types of public and private higher education institutions in the United States, we hope that our critical examinations and reflection on how DT is used across disciplines can offer insights related to how DT pedagogies can support liberatory teaching and learning.

LITERATURE REVIEW

DT is most commonly understood as a creative and collaborative problem-solving approach that evolved from multiple fields, including design, architecture, business, and engineering (Matthews and Wrigley 2017; McLaughlin et al. 2022; Wrigley and Straker 2017). The process has gained popularity in higher education because DT provides a set of practices that can prepare the next generation with the needed skills, methods, and mindsets for responding to wicked problems (McLaughlin et al. 2022; Lake, Flannery, and Kearns 2021; Wrigley and Straker 2017). These practices have especially gained traction in the health professions (Lor 2017) and leadership fields (Lake, Flannery, and Kearns 2021).

DT practices have also been critiqued, adapted, and applied to address complex societal challenges such as healthcare, food justice, K–12 educational equity, governmental policy, and more (Buchanan 2019; Brown and Wyatt 2010; Lake, Flannery, and Kearns 2021; McLaughlin 2019; Noel 2022; Noel, Liu, and Rider 2019; Udoewa 2023). While there are many different DT frameworks, they share a common cyclical process and set of iterative, collaborative practices that include: empathy, exploration, ideation, and prototyping (aka experimenting) (Cochrane and Munn 2016; McLaughlin et al. 2023; Panke and Harth 2018). This cyclical and iterative process is characterized by two complementary modes of thinking: divergent (i.e., creating and diversifying choices) and convergent (i.e., aligning and making choices). These forms of learning support the cogeneration of ideas that explore and test diverse possibilities (Fixson and Rao 2014; Guaman-Quintanilla et al. 2023).

A growing number of studies have examined DT pedagogical practices while assessing their impact on learning (McLaughlin et al. 2022, McLaughlin et al. 2023, Lake, Flannery, and Kearns 2021; Beligatamulla et al. 2019; Panke 2019; Taheri et al. 2016). These studies collectively suggest that DT encourages students to not only ideate more radical possibilities, but also to uncover actionable opportunities through experimentation and prototyping. DT pedagogies have been found to be effective in developing students' creative confidence (Taheri et al. 2016) and in fostering a more participatory approach to problem-solving (Lake, Flannery, and Kearns 2021). Studies have found that DT is effective in reducing cognitive bias, fostering empathy, embracing ambiguity, and decentering disciplinary expertise (Bleakley 2021; Liedtka, Hold, and Eldridge 2021; Köppen and Meinel 2015; Panke and Harth 2018; Seidel and Fixson 2013). According to Noel (2022), liberatory design pedagogies: 1) cultivate critical questioning of the self and the systems within which students are embedded and 2) prompt collective, iterative actions intended to transform (3).

On the other hand, courses integrating DT practices to cultivate students-as-designers can perpetuate colonial practices and reinforce inequitable power dynamics between students and those they design with and for (Udoewa 2022). Interviewing and observation practices within research-based DT course projects can be used to extract knowledge from communities in order to advance problematic institutional priorities, research interests, course learning goals, or profit margins (Akama, Hagen, and Whaanga-Schollum 2019; Escobar 2018; Grimes et al. 2021; Irani 2018; Jamal, Kircher, and Donaldson 2021; Rittner 2020; Shahjahan et al. 2022). "Student-centered" DT pedagogies that engage external stakeholders (e.g., community partners, research participants, community members, etc.) can exploit and harm communities by reinforcing oppressive frameworks embedded in courses, disciplines, institutions of higher education, and society more broadly (Ansari 2019; Costanza-Chock 2020; Escobar 2018; Noel 2022). In response to these concerns, educators, practitioners, and researchers have been advocating for critical and pluralistic approaches to DT teaching and learning praxis (Escobar 2018; Borge et al.2020; Costanza-Chock 2020; Udoewa 2022; Vink 2019; Wagoner 2017).

To better understand current DT processes and outcomes across courses and assess the potential of DT, this study critically examined the experience and perceptions of DT from faculty and students across disciplines. It was guided by the following research questions:

1) What design thinking practices do faculty and students report?
2) What outcomes do faculty and students report?
3) How do reported design thinking practices and outcomes support or hinder liberatory teaching and learning experiences?

METHODS
Research design
To deepen understanding of DT practices, outcomes, and challenges and to build upon prior research, we used a mixed-method sequential explanatory research design (Creswell and Clark 2018; Ivankova, Creswell, and Stick 2006). The research was determined to be exempt from further review by all four university review boards according to 45 CFR 46.104. Purposive sampling was used to identify 23 courses across four universities in the southeastern United States during the 2020–2021 academic year. In August 2020, team members identified faculty teaching courses that infused DT pedagogies and invited them via email to fill out an online survey that described their course. They were also invited to complete an optional semi-structured interview with our research team and encouraged to invite their students to participate in the study at the end of the semester. We first collected and examined quantitative data to gain an initial understanding of DT practices, outcomes, and experiences (research question 1). To further clarify and interpret the quantitative data, we then gathered and analyzed qualitative data via semi-structured interviews (research questions 2 and 3). See Table 1 for a summary of our research questions, measures, and total participants across 23 courses at four southeastern universities.

Table 1. Study questions and measures

Research questions	Data collection instruments	Items	Participants
What design thinking practices do faculty and students report?	Faculty Qualtrics survey: 5-point Likert scale Faculty and student semi-structured interviews	11 DT practices questions and 42 outcome questions Faculty: Appendix A: Q1–Q5 and probing questions Students: Appendix B: Q2, Q3, Q6–Q8 and probing questions	Faculty (n=19) Students (n=196) Faculty (n=18) Students (n=19)
What outcomes do faculty and students report?	Faculty and student semi-structured interviews	Faculty: Appendix A: Q6–Q7 and probing questions Students: Appendix B: Q4, Q9–Q12 and probing questions	Faculty (n=18) Students (n=19)
What DT practices support or hinder liberatory teaching and learning	Faculty and student semi-structured interviews	Faculty: Appendix A: Q5–Q11 and probing questions Students: Appendix B: Q5, Q13, Q14 and probing questions	Faculty (n=18) Students (n=19)

Quantitative methods and analyses

To allow for comparisons to earlier studies, we adapted a survey instrument on DT practices and outcomes from Lake, Flannery, and Kearns (2021) and Liedtka and Bahr (2019). The online Qualtrics survey prompted faculty and student participants to provide demographic information, course-specific information, the range of DT practices used, and outcomes perceived, along with any recommendations for future courses. The survey included 11 items about DT practices and 42 items about outcomes. The 11 practice items included "followed a structured process," "formed a diverse team," "emphasized active listening to find shared meaning," "done user research using ethnographic tools," "focused your problem definition on user's perspective rather than the organization's," "created a set of design criteria that described an ideal solution based on user research," "generated a diverse set of ideas based on your user research," "created prototypes of your ideas," "moved multiple ideas into prototyping and testing," "got feedback from users and other stakeholders on the prototype," and "executed real world experiments to test your ideas."

Factor analysis revealed that these 11 practices could be grouped into three teaching and learning constructs valuable for faculty, including "discovery and ideation," "team formation and functioning," and "prototyping and experimentation" (McLaughlin et al. 2022). The 42 DT outcomes were categorized into five categories: showing the process supported project implementation, provided psychological benefits and increased motivation; built relationships and trust, improved the quality of solutions, and encouraged adaptation and flexibility.

All items were measured using a 5-point Likert scale with item responses 1–never, 2–rarely, 3–sometimes, 4–frequently, and 5–almost always. At the conclusion of the survey, participants were asked whether they wanted to participate in an optional follow-up interview with a member of the research team. Descriptive statistics, namely median and range, were used to assess the frequency that faculty and students mentioned observing specific DT practices and outcomes in the interviews. Psychometric analyses demonstrating the validity and reliability of the survey data have been reported (McLaughlin et al. 2022).

Qualitative methods and analyses

We applied an intentional grounded theory approach (Tie, Birks, and Francis 2019) to our data collection and analysis. Faculty and students who indicated interest in participating in the optional, follow-up interviews were contacted by a member of our research team and scheduled for a 30- to 60-minute interview. All interviews were recorded via Zoom and members of the research team took notes on each interview using a standard template (see Appendix C). Data collection continued until saturation was reached.

Interview guides (see Appendix A and B) were designed to provide further insight into research questions one and two (about DT practices and outcomes); and to explore how reported design thinking practices and outcomes support or hinder liberatory teaching and learning experiences. The guides also asked about the benefits and challenges of DT practices and outcomes, how DT supports the interviewees' values and goals, and ways to improve the DT course. The sequential mixed-method study design allowed researchers to adjust and align interview questions based on participants' survey responses. For instance, some survey respondents indicated that they implemented DT pedagogies to support collaborative learning. This response led researchers to ask interviewees for details about the collaborative process and how DT practices supported this learning form. Similarly, other survey respondents noted that DT was used to support real-world projects (i.e., client-based or community-based partnerships). This response led interviewers to ask how DT practices supported valuable and viable outcomes.

The three-step coding process started with open coding by breaking the interview data into discrete parts and labeling them with concepts relevant to the study. We then used an action–word approach (Charmaz 2003), coding specific actions taken and activities experienced by faculty and students during the teaching and learning process. The research team sought to strengthen the validity of the findings through investigator triangulation. We met weekly throughout the interview process and the subsequent semester to compare notes, discuss, and analyze the qualitative findings. This analysis led us to identify themes for each research question. After discussing discrepancies and aligning line-byline codes across the team, we compared codes to our research questions in a third round of coding. Our analysis process required ongoing revision as statements were continually reduced into emerging themes.

Mixed methods analyses

To examine relationships between practices and outcomes (research questions 1 and 2), comparisons between codes and surveys were made; this analysis indicated that the qualitative codes reinforced interview findings, revealing patterns and themes noted in interviews. To explore how various disciplines frame and apply DT, we mapped the description of the courses given in the interviews onto the approaches and reviewed the latest research on DT teaching and learning practices. We then compared findings to the literature on liberatory DT practices and decolonizing higher education to address research question three.

FINDINGS

Descriptive statistics of research participants

Faculty and students from 23 courses responded to the survey and the follow-up interviews. Participants were primarily white (faculty n=14, 73.7%; student n=129, 75.4%) and more diverse by gender (female faculty n=11, 57.9%; female students n=124, 63.3%). Approximately half of the students were majoring in interdisciplinary humanities and social sciences (n=105, 53.6%), and the rest of them were majoring in business and entrepreneurship (n= 32, 16.7%) or design and engineering (n=45, 23%). Additional basic information about faculty and student participants is summarized below in Table 2.

Table 2. Characteristics of participating faculty and students

Characteristic	Faculty (n = 19), n (%)	Students (n = 196), n (%)
Race: *White*	14 (73.7%)	129 (75.4%)
Black/African American	0 (0%)	14 (8.2%)
Asian	4 (28.6%)	21 (12.3%)
Hawaiian/PI	0 (0%)	5 (2.9%)
American Indian/Alaska	0 (0%)	2 (1.2%)
Ethnicity: *Hispanic*	0 (0%)	10 (5.1%)
Gender: *Female*	11 (57.9%)	124 (63.3%)

Course designations

Based on the epistemological similarities of the disciplines and pedagogical traditions, participating courses were categorized into business and entrepreneurship (n=7, 28%), design and engineering (n=5, 20.3%), and interdisciplinary humanities and social sciences (n=13, 52%) fields. Analysis of course information from the survey indicated that courses labeled as "business and entrepreneurship" focused on developing and executing strategic and innovative mechanisms for managing and allocating resources. For instance, one course required students to complete a feasibility study using the DT process while other students were required to develop a process-based solution for a community-based organization. Courses labeled "design and engineering" emphasized devising and optimizing the application of technological, scientific, and design principles and apparatus for problem-solving. "Design and engineering" courses tended to ask students to

implement DT practices to better understand those they were designing for. The courses labeled "interdisciplinary humanities and social sciences" centered around studies of social and cultural life of human beings and their behaviors as individuals and collectives. These courses tended to use DT to help students better understand the complexities of social problems and generate potentially actionable future interventions. For instance, one course in this category integrated DT practices to support student-selected social justice action projects.

RQ 1: What DT practices do faculty and students report?

The survey results revealed both common and distinctive patterns in the way faculty and students apply DT practices across disciplines. In general, students' responses to DT practices correspond with faculty's responses. For instance, both faculty and students consistently reported a moderate (3=sometimes) to high (4=frequently) level of engagement with 10 of the 11 DT practices, noting that they "executed real-world experiments" less frequently. Among all 11 DT practices, Table 3 lists practices with the highest and lowest median scores. Interviews confirmed these findings and generated new insights that further situated student and faculty perspectives on DT pedagogical practices.

Table 3. Most frequently reported DT practices

DT practices	Faculty (n=16) Median (Range)	Students (n=163) Median (Range)
Followed a structured process	4 (3–5)	4 (1–5)
Emphasized active listening among team to find shared meaning	4 (2–5)	5 (2–5)
Focused problem on user perspective rather than org	4 (2–5)	4 (2–5)
Moved multiple ideas into prototyping	3 (1–5)	3 (1–5)
Executed real-world experiments	4 (1–5)	3 (1–5)

All items measured on a 5–point scale from 1–never to 5–almost always.

Similarities

Across courses, DT practices offered adaptable methods to be used in multiple contexts and built students' skills in active listening and relational learning.

Adaptable methods: Interviews confirmed survey findings, revealing that faculty most frequently valued DT's support for helping students learn through a flexible, structured process that could be applied to diverse issues across fields and communities. When analyzing the qualitative codes, we discovered that most faculty utilized DT practices to orient students towards relational, project-based learning. Faculty also felt DT practices helped students gain transferable skills through encouraging students to engage with diverse perspectives, develop effective collaborative relationships, and co–create knowledge.

Although faculty adopted different DT frameworks, they all suggested that DT practices provided students with a core set of adaptable structures and methods to support the messy and iterative processes of collaborative, project-based learning. Representing this consistent finding, a

faculty member from biochemical engineering noted that the human inclination to make "efficient" and "quick" decisions erodes trust in teams and suppresses the emergent process of generating creative ideas. This faculty member valued how DT practices prompt divergent and convergent thinking, foster humility, and generate open–mindedness:

> Mentally, I think humans fundamentally were wired to make decisions as quickly as possible for survival. And fundamentally, I think design thinking is an inefficient process when it comes to making quick decisions because it explicitly calls out these steps. The reason it works so well is because it separates divergent and convergent thinking, especially when doing things like brainstorming or ideation. I think they are really important. So that's one of the aspects that I certainly spend a lot of time focused on.

Active listening: Almost all the interviews consistently revealed that courses across disciplines placed a strong emphasis on active listening. According to a biochemical engineering student, active listening is an "interview process and ethnography process of listening and trying to understand" how to "define and redefine" a problem. In course projects where students partner with external community collaborators, active listening intersects with DT practices that encourage students to engage those with the lived experience of the issues being examined, rather than focusing on the organizations' perspective alone. A graduate student in public health, for example, noted that active listening solidified and strengthened their commitment to designing with people most directly impacted, saying:

> I'm forever feeling like women are not heard and not listened to, yet we're spending money and making programs that are supposed to address the health of women. So this class sort of solidified and strengthened [my view]: we do need to be listening to the people who are experiencing our work and they need a seat at the table.

A student in engineering physics also mentioned the details of their listening and mapping sessions with the course partner,

> We talked about their life, age, family situation, occupation, their attitudes towards technologies, like everything. So, it's really just getting their personal life out of it, what did they value in life . . . and that helps us understand them, understand their life, not just the technical part, like what's their problem? How can we fix it?

Relational learning: Linked to the emphasis on active learning, analyses also clearly showed that DT supported relational learning across courses. Most students and faculty noted that DT not only facilitates learning from and with peers, but also encourages interaction with those experiencing a particular situation. For instance, a faculty member of a leadership course said they designed their course to have their students "learn how to situate their understanding of the problem in the people, from the people who are experiencing it and not jump to their own solution." A student of sustainability studies suggested DT helped them think about ways to "reaching out to partners, to engage with different groups, [and] how we might go through the iterative process of creating our own partnership, our ability and communication skills, back and forth."

Differences

While there were several similarities noted across how faculty and students engaged in and conceptualized DT practices, there were some notable differences:

Engaging in prototyping and experimentation: Both surveys and interviews revealed that prototyping and experimentation were underutilized DT practices. The interviews further suggested that students from design and engineering, and business and entrepreneurship courses practiced prototyping significantly more than interdisciplinary humanities and social sciences courses. For instance, a first-year design student noted in the interview, "we did a lot of prototyping and experimentation. We would just kind of do our own experimentation and come together to figure out what was best or what ideas we could pull from one another." However, a faculty teaching a leadership studies course noted the difficulties of prototyping with their class,

> You can prototype some things really easily when it's something tangible and concrete. Those aren't tangible and they're really hard to prototype. If you're trying to change a policy, you can draft it by what would that policy look like, if you're trying to change how students live their lives? That's really complex and not easy to prototype. I think that's one of the biggest challenges.

Conceptualizing "prototype": The interview data also suggested that faculty from different disciplines had varying understandings of prototyping and testing. In particular, the interdisciplinary humanities and social sciences faculty tended to have ambiguous perceptions of prototyping and different attitudes toward it. For instance, some interdisciplinary humanities and social sciences faculty counted a midterm presentation as prototyping, but others suggested that they were not good at prototyping, that they did not fully understand the associated methods, or that they do not know how to integrate prototyping and testing pedagogies into their disciplinary contexts. Even for design and engineering disciplines with a more established concept of prototyping and experimentation, the iterative nature of DT made it challenging to describe and operationalize. As noted by a design professor, "When I teach design thinking, usually I combine design thinking and design making because prototyping is a very important part . . . Somebody could argue that prototyping and experimentation could be part of ideation because it is a back-and-forth [process]." While the findings above offer insight into how DT practices are understood, implemented, and valued across disciplines, the analysis of outcomes noted next explicates how these DT practices support critical changes in students' mindset.

RQ 2: What outcomes do faculty and students report?

The survey asked faculty and student respondents about 42 DT outcomes. Again, students' responses consistently affirm faculty's responses across disciplines. Except for "built new relationships locally that continued after the initial project was completed," the mean scores reported by both students and faculty for the other 41 DT outcomes are at a moderate (3=sometimes) to a high level (4=frequently). The following items in Table 4 are the DT outcomes with the highest and lowest mean scores from both students and faculty.

Table 4. Most frequently reported DT outcomes

DT outcomes	Faculty (n=16) Median (Range)	Students (n=163) Median (Range)
Created a deeper understanding of stakeholder needs	4 (3–5)	4 (2–5)
Improved the creativity of new solutions	4 (3–5)	4 (1–5)
Fostered the inclusion of user input	4 (3–5)	4 (1–5)
Create a common language/framework among team members	4 (3–5)	4 (1–5)
Allowed new and better solutions, not visible at the beginning of the process, to emerge during it	4 (3–5)	4 (1–5)
Enhanced other stakeholders' willingness to collaborate on new solutions	3 (1–5)	4 (1–5)
Built new relationships locally that continued after the initial project was completed	3 (1–4)	4 (1–5)

All items measured on a 5–point scale from 1–never to 5–almost always.

Interview analyses confirmed the outcomes above and revealed how faculty and students felt DT pedagogies supported these critical changes. For instance, interviews revealed that respondents felt prototyping, testing to learn, ethnographic interviewing, critical observation and collaborative brainstorming were most responsible for encouraging habits of empathy. Respondents felt DT practices, like creating and prioritizing design criteria, generating diverse ideas, and receiving iterative feedback, encouraged growth in students' willingness and ability to engage in emergent thinking, replacing habits of latching onto a "first, best answer." We elaborate on these critical changes below.

Situated and action-oriented empathy

We found that courses that emphasized the need to learn from oneself, others, and complex social systems that frame the course project helped students to empathize more fully with the complex and sometimes conflicting realities of the issues they were examining. An undergraduate student in design described her experience of embracing empathy as a significant mindset shift, saying:

> When I got that prompt, [empathy], I was kind of annoyed with it because I didn't really know where to go . . . but I ended up being thankful that that was my prompt . . . I say this sentence "empathy is important to consider in design" and that seems like an obvious statement but I think it's important for designers to learn how that gets applied

and where that gets applied and what different things you have to think about in order to actually tangibly apply that in practice.

A graduate student in public health articulated the importance of understanding the context of a situation through empathy:

> Yeah, to do good design thinking activities with the users you need to first understand the system that they are reporting on. Without this exercise of thoroughly understanding the system, understanding of the stakeholders, the social determinants that are contributing to the problem, the power dynamics, politics, etc., engaging with users in the population and interpreting their feedback is going to be a bit superficial. Because you don't understand the context of their problem.

Connecting DT to system thinking and lived experience, students, like the one above, framed their design projects within larger social systems constituted by a constellation of contested realities, values, and different perspectives. The same student noted their change in mindset by relating DT and systems thinking to their everyday lived experience during the stay-at-home pandemic year:

> The first bit of this course was on systems . . . [which] is intertwined with design thinking . . . I have a nine-month-old . . . My nine-month-old eats soil from our potted plants. First, I was upset and then I was like, fine, eat the soil, you're not going to die. And then I thought, okay, every system is designed to get you to know . . . so then I'm thinking I've set this up in such a way that she is going to eat the soil. Instead of punishing her, I need to change the system and change her environment.

The evolving understanding of complex situations and genuine motivations to get to know others and their contexts makes room for both emotional and cognitive openness and relationship building, creating a foundation for divergent thinking, creativity, and innovation. Meanwhile, we also acknowledge that the lack of prototyping and experimenting cannot fully translate the cognitive and affective aspects of empathy into actions.

Encouraging emergent thinking

Interviewees felt the structured, adaptable, and iterative nature of the DT process made students more aware of and better prepared to embrace the emergent nature of problem-framing and problem-solving for real-world complexities; they were more willing to "lean into failure" as a pivot point instead of viewing it as a barrier. As a senior undergraduate student in engineering physics commented,

> I'd say that failure is necessary. I feel like many people could get bogged down and be like, oh, I need this to be completely perfect. Now I've found personally that it's better to go through it many times and then come out with, like, maybe a new third or fourth try having a successful idea and prototype rather than your first one.

Interviewees also noted that students realized that they could engage with emergent processes by testing bits and pieces of solutions rather than full solutions to get feedback to develop better ideas. As a faculty member from physician assistant studies remarked,

> I think by teaching them that they realized that our solutions are not always gonna be like, black and white . . . we can try something we haven't tried before and there may be nuggets in there that help us improve. You don't have to take somebody's full idea. But there may be a piece of that idea that you can apply to what you're doing.

Both survey and interview findings revealed that most faculty and students felt DT-infused pedagogy led to increased emergent thinking by challenging students to contextualize and reframe problems constantly and to question the existence of the best solutions.

RQ 3: How do reported DT practices and outcomes support or hinder liberatory teaching and learning experiences?

Detailed next, both the surveys and the interviews revealed ways in which DT classroom practices support efforts towards liberatory teaching and learning.

Examining bias

Both faculty and students felt DT methods guided students to examine their own biases and preconceptions (4.00, 0.25), gave them more confidence in their creative abilities (4.00, 1.00), and prompted dispositions toward empathic learning and emergent thinking. Findings showed that DT supported student efforts to navigate complexity by providing multiple ways to seek out diverse forms of knowledge. As a compass, DT was clearly helpful when students were confused or stuck and needed to consider what came next. DT offered a host of practices that helped students navigate uncertainty, reinforcing that there is no singular "right" answer to complex challenges. It encouraged next steps that acknowledged multiple ways of knowing and acting.

Characterizing this sentiment, one public health student aptly noted DT helped them move from thinking, "This problem is too big, you can't do it" to being "okay" with the messy process of ideation, testing, and seeing a way forward. A biomedical engineering student said, "We were uncomfortable with unknowns, which we came across a lot, because not everything has been researched before. So, there might not be an answer until we test it out." By giving students opportunities to move beyond singular, "right" answers and creating space for multiple ways of knowing and acting, DT practices inherently support efforts towards liberatory teaching and learning practices."

Multiple ways of thinking

Related to the finding above that underscores the importance of honoring multiple ways of knowing, cultivating emergent thinking, and prompting diverse opportunities for action, specific DT practices highlight the importance of imagining alternative realities and testing many possibilities before settling on one. A social service faculty member helped their students "breathe life into" their project by explicitly requiring them to discover the nuanced characteristics of the local community they served without relying on Google. Two engineering students from different institutions acclaimed the benefits of DT in helping attain alternative solutions by "taking inspiration from multiple perspectives" and "trying to understand from as many vantage points as possible."

Decentering authority

Faculty in interdisciplinary humanities and social science courses were more intentional about using DT to help students reflect on internalized oppression and decenter authority. For instance, one faculty member who taught arts administration noted how he used DT to encourage students to think critically about inequities that emerge from colonial, hierarchical gatekeeping practices within the arts.

> You're taught that there are gatekeepers, and those gatekeepers have a higher value than the general population. So, to use design thinking brings an egalitarian approach to the arts that is central to arts administration, but it's not necessarily central to a lot of the more classical art forms . . . you can't identify a few key individuals who decide what is good art.

He further clarified in an email correspondence with the research team,

> The gatekeepers are those who have amassed power under the guise of experience in the field: critics, teachers, producers, donors, etc. While I did not exclusively refer to White people, gatekeeping is most certainly rooted in colonial hierarchy and is exploited by those who benefit from the wealth and privileges of this hierarchy.

An undergraduate student in sociology echoed this analysis, recognizing the importance of questioning expertise and amplifying the voice of people from communities historically marginalized through the perpetuation of Eurocentric hierarchies (Trisos, Auerbach, and Katti 2021), with the following statement:

> When you go into some communities, you're not the expert. Like me walking up to communities of color and being[like]I know more about racism, which is not true. That is not my own lived experience. . .The ultimate experts on things and many issues are people that live in those bodies every day and experience the systematic suppression of their entire lives.

In the same vein, a communications student emphasized that DT methods shifted their team's mindset by prompting self- and other-awareness. This student reflected on the fact that their "entire team were white females. We were not the right ones to define this problem space."
The student went on to say that this awareness led them to design for community self-determination. "We are not telling them what to do, [instead] we are trying to give them ideas to make those decisions themselves."

These faculty and students consistently indicated that DT practices helped them visualize existing assumptions and habituated actions that hampered the generation and coordination of more inclusive and equitable project-based work. A faculty member who taught an entrepreneurship course further suggested that the unique aspect of using DT in their course was to place "inclusivity, transparency, and being open in co-creating with the community" at the forefront. Furthermore, an economics student commented "If you don't know what the problem is and you're just running off of false assumptions, what you make is not going to have value." A design student reflected on the benefit of DT, saying, "If you're not a member of that group, you're probably not going to think of the same things that people within that group think . . . it's important to talk to people who are from the

group you're trying to design for." These findings demonstrate that DT practices support decolonial teaching methods by fostering structured, flexible learning environments that lead to stronger relationships, more creativity, and mindset shifts that students can apply to their discipline-specific coursework and future careers.

DISCUSSION

This study extends previous design thinking research by examining practices and outcomes across disciplines within higher education institutions and from both faculty and student perspectives. The DT-infused pedagogies documented in this study consistently generated promising learning outcomes across disciplines. We found that DT was most often used by faculty who participated in the study to 1) navigate complex and collaborative problem-solving processes (i.e., operate as a compass), 2) animate learning experiences (i.e., provide a set of methods that enables relational exploration, creative idea-generation, and iterative prototyping), and 3) liberate individual ways of thinking (i.e., mindsets). In alignment with prior research, faculty and students across courses felt DT practices provided adaptable methods that fostered active listening, situated and action-oriented empathy, relational learning, and emergent thinking, all of which are key dimensions of decolonial teaching and learning (Beligatamulla et al. 2019; Hartman et al. 2020; Sharples et al. 2016; Seidel and Fixson 2013).

We also found opportunities for future growth. First, the concept and practice of prototyping was a highly valuable, but less understood and utilized practice. Cross-disciplinary resources and examples of how to do this effectively could be valuable for faculty using DT. Second, only some faculty (primarily those in interdisciplinary humanities and social sciences) are intentionally integrating equity-centered DT practices into their courses. Their experiences further show the potential for DT practices that more fully support decolonizing, liberatory teaching and learning. Less than half of the students were actively reflecting on their personal bias, how this might impact the design process, or how their project outcomes might cause harm to human and nonhuman others; few students related DT to social justice issues beyond the immediate context of their course.

The lack of in–depth self–reflexivity and the failure to draw explicit connections to larger social justice issues indicates there are missed opportunities for facilitating liberatory classroom activities focused on better understanding colonial influences and systemic oppression. This leads us to suggest that more emphasis on humility and self-reflexivity would be valuable; in particular, we recommend faculty and students integrate critical self-reflexive practices, whereby they consciously scrutinize and challenge their own biases concerning systemic colonization and oppression. There are clear opportunities for the courses in this study to integrate decolonizing practices that encourage explicit connections between design, power, and human conditions (Tunstall 2020). In addition, it is crucial to set and manage project expectations with external project partners and stakeholders up front and to be explicit about the benefits, drawbacks, and potential risks of engaging in course-based projects that operate within larger systems and institutions.

With these findings in mind, we recommend that DT should be (re)framed as a set of practices that emphasize situated and action-oriented empathy, relational learning, emergent thinking, and diverse ways of knowing. Such a framing visualizes how DT practices can support the movement toward pedagogies that cultivate liberatory course projects and decolonial mindsets.

LIMITATIONS

Although the convenience sampling approach did not yield enough student participants, which may result in bias from underrepresentation, we involved four different types of public and

private higher education institutions that serve diverse populations as well as courses representing various disciplines. Due to sampling issues, this study is not able to prove correlations between DT practices and outcomes through statistical models. Survey and interview questions did not always provide researchers with a full understanding of the DT journey and outcomes. We were not able to include questions about prototyping and experimentation in our survey or interview guides as challenges around these topics came later in our data analysis process. In particular, it was hard to situate and decipher prototyping and testing practices in some courses and to track whether tangible products or services emerged from the DT process. We recommend future research studies examine the viability and value of the course projects from the perspective of those most impacted by the projects (students, course partners, and surrounding communities).

CONCLUSION

In conclusion, we recommend future research efforts engage faculty, students, higher education institutions, and community stakeholders from across diverse spaces. Future lines of inquiry should focus on exploring the long-term impacts of DT pedagogies, especially how various DT practices serve to oppress or liberate and what conditions support equitable and mutually beneficial community, student, and faculty collaborations that dismantle systemic oppression. Such efforts can cultivate socially just change-making pedagogies that are more likely to yield supportive long-term outcomes for students, faculty, and surrounding communities.

AUTHOR BIOGRAPHIES

Danielle Lake is the director of design thinking and associate professor at Elon University. Her scholarship, teaching, and service explore the potential and the challenges of relational, place-based design projects for addressing wicked problems, building capacities, and transforming systems. Learn more about the Center for Design Thinking here. and check out the Power and Place Collaborative [here](#). To read more about her research see [these selected works](#).

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NOTES

1. Other survey items of DT practices include, "formed a diverse team, done user research using ethnographic tools," "focused problem on user perspective rather than organization," "created a set of design criteria that described an ideal solution based on user research," "generated a diverse set of ideas," "created prototypes of ideas," "got feedback from users and other stakeholders on prototypes."
2. Following Udoewa (2022), we define decolonization as a process, practice, or set of methods and structures that are free from imposition and increase agency, giving "control over resource(s)" (6). Resources are also considered broadly within this framework and include access to and the ability to create knowledge and material resources (Asante 2006; Smith 2021).
3. The one outcome experienced less frequently was "built new relationships locally that continued after the initial project was completed."

ETHICS

Research was approved through the University of North Carolina, Chapel Hill ethical review processes.

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APPENDIX A
Faculty interview guide
1. Definition of DT: Based on your experiences, how do you define design thinking? What courses, people, or literature inform your definition?
2. Teaching and Learning: How were you trained in design thinking? When did you start teaching design thinking? Why?
3. Course learning objectives: How did your learning objectives engage with design thinking (explicitly or implicitly)?
4. Aims: What were your aim(s) in integrating DT practices? Why did you use the DT process for? What were you hoping it would do?
5. Design thinking practices (faculty perceptions): Describe or give an example of a course project/activity that uses DT. Which design thinking practices [show survey options] do you think your course facilitated the most? Which design thinking practices [show survey options] do you think your course facilitated the least?
6. Benefits (faculty perceptions): What are the most beneficial or valuable aspects of this course for your students? How can you tell? Which of these design thinking outcomes for students [show survey options] is most important? Why? What are the most beneficial or valuable aspects of this course for you?
7. Challenges: No practice ever goes perfectly smooth. What sort of problems or barriers did you confront while teaching this course? What happened? What was the result? What did you learn? How did you try to address this?
8. Course Materials/project descriptions/etc.: What course materials (syllabi), project instructions, and other items that we can review to help understand the various DT practices students engaged in?
9. Resources: What additional resources could you use moving forward to enhance your DT curricular practices?
10. Conclusion: Finally, is there something I have not asked you that you would like to say or share?

APPENDIX B

Student interview guide

1. Intro: Tell me a little bit about your (intended) major. How did you choose this major? What kinds of careers are you interested in exploring?
1. Baseline understanding of DT: What is your definition of design thinking? What courses, people, or literature inform your definition?
2. Recall of DT practices: I'd like you to think back to [insert course, program, or workshop name], tell me what you *remember* about the design thinking aspects. What design thinking practices did you do?
3. Benefits of DT practices: What were the most beneficial or valuable aspects of this course professionally? Personally? Civically? Can you explain why or how you found this valuable? What DT activity, process, or assignment was most helpful? How so?
4. Challenges: No practice ever goes perfectly smooth. What sort of problems or barriers did you confront in the course? What happened? What was the result? What did you learn?
5. Goals and value alignment: To what extent did the design thinking practices support your goals and values? How do you see these practices supporting your goals now? Did the design thinking practices help to shape or make you more aware of your values in any way? If so, how?
6. Compare/contrast: How was this course similar to other courses you have taken? How was this course different from other courses you have taken?
7. Relationships: Reflecting back, how do you compare being a member of this [course/program/workshop name] in comparison to others? Did or do you maintain relationships with any of the people from the course?
8. Experience: Tell me about your life right now? In what ways are you using any of the DT processes learned from this course?
9. Social Change/Social Justice: What are the issues that you care about most (issues that are on your mind on a weekly if not a daily basis)? Are you currently using any design thinking processes to address the issues that are of greatest concern to you?
10. Agency over learning: How has this course influenced the amount of control you felt over your learning processes and pathways in this course?
11. Feedback: How would you strengthen this course?
12. Conclusion: Finally, is there something I have not asked you that you would like to say or share?

APPENDIX C

Interview notes template

1. Perceptions, concepts, experiences associated with DT
2. Aims, objectives, and goals of using DT
3. Major DT projects
4. Other DT pedagogical practices
5. DT values and benefits
6. Student's reactions
7. DT outcomes
8. What is the story I heard?
9. Additional probing questions you asked
10. Inconsistencies/big gap between survey and interview
11. Note any unusual/significant/emerging ideas
12. Suggestions for following interviews
13. Connections to literature
14. Other important thoughts