# Design Education for Alternative Futures:
# Climate Disaster, Artificial Intelligence, and DEIBJ?

**Peter Scupelli**

Carnegie Mellon University, United States

**Abstract**

*How engaged should design education be with the unfolding Climate Disasters, technology, and DEIBJ (diversity, equity, inclusion, belonging, and justice)? Is the next generation of designers prepared to lead zero-carbon lifestyle transitions? Second, what role might Artificial Intelligence (AI) play in design education? Thirdly, what does engaging with topics such as design for the pluriverse, "decolonizing design," and DEIBJ practically involve? I explore eight alternative futures in a 2x2x2 cube of possibilities with three axes: Climate Disaster engagement, technological change, and DEIBJ. Future 1 is the "business as usual" of design education. (e.g., no meaningful engagement with AI or unfolding Climate Disasters). Future 2 is the "high-tech status quo" (e.g., engagement with technology such as AI but not Climate Disasters). Future 3 is a "Sustainable Luddite Design" (e.g., Engagement with Climate Disasters but ignoring AI and technology). Future 4 is "AI for Climate Disasters," using advanced technologies to engage with zero-carbon lifestyle transitions and social innovation. Futures 5-8 emerge, adding the DEIBJ to the four futures mentioned. In this paper, I describe a survey conducted with faculty, staff, and students at the School of Design at Carnegie Mellon University. The first set of questions probed the personal outlook on the future ten years out and the perceived agency on such futures. The second set of questions asked about interest and engagement with emerging topics. The third set of questions asked about the comfort and frequency of teaching emerging issues. Close to two-thirds of all participants thought they could impact the future in ten years (half of which thought the future would be worse, and the other half better). Close to one-third of participants said the future was worsening and they lacked agency. Most of the faculty said they were comfortable teaching emerging topics. Regarding the frequency of teaching, it was surprising to note that SDGs and zero-carbon lifestyle transitions were in the "rarely "and "sometimes" taught range. DEIBJ frequency was between "sometimes" and "a good bit." In contrast, "decolonizing design" and "design for the pluriverse" were in the "sometimes" range, suggesting that university and college leadership motivate faculty teaching frequency.*

**Keywords:** *design education, climate change, AI (artificial intelligence), DEIBJ (diversity, equity, inclusion, belonging, justice), technological change*

## 1. Introduction

Many educators are questioning design education paradigms due to 21st-century societal challenges such as climate change (e.g., [1]), the fourth industrial revolution (e.g., [2]), and emerging technologies (e.g., [3]). Historically, design education evolved to meet emerging societal needs. Today, a design educator might ask: are students prepared for changes linked to the unfolding climate disaster, emerging technologies (e.g., Artificial Intelligence, Spatial Web, Augmented Reality), and societal challenges (e.g., diversity, equity, inclusion, belonging, and justice)? Likewise, design professors may wonder what part of the curriculum should remain unchanged, what parts should be changed, and what topics to teach.

### 1.1 Engaging the Climate Disaster, Rapid Technological Change, and DEIBJ?

What futures signs might one focus on? In the School of Design, there have been lively debates about three societal challenges. One wonders what types of futures link to such futures signs. How might design schools, university curriculums, and faculty respond? For example, how engaged should design education be with the unfolding Climate Disasters (e.g., [4]), rapid technological change such as Artificial Intelligence (e.g.,[5]), DEIBJ (diversity, equity, inclusion, belonging, and justice) (e.g.,[6]), more generally "decolonizing design" [7], and "design for the pluriverse"[8]. Next, I describe each area.

**The unfolding climate disasters** illustrate the urgent need to reduce carbon emissions by 50% by 2030 and accomplish net zero-carbon lifestyles by 2050 [9]. First, most scientists worldwide agree that human carbon emissions are responsible for the unfolding climate disaster [9]. Business, design, and customer choices created the unsustainable carbon-rich lifestyle today. Are the next generation of designers prepared to lead zero-carbon lifestyle transitions, or are they trained to perpetuate the carbon economy responsible for the unfolding climate disasters? What is core to any design education? What do students need to learn to design zero-carbon lifestyles? Many may feel apathy and are unsure how to approach the challenges of

zero-carbon lifestyles [10]. What might design lead innovation for zero-carbon lifestyles include? What products and services might help to accomplish and maintain zero-carbon lifestyles? How might design education focus on zero-carbon lifestyle products, services, and experiences?

**Technological change** rapidly engulfs everyday life, societies, organizations, and the planet. Four industrial revolutions significantly shifted human experiences, societal organization, and environmental impacts [2]. The first industrial revolution is linked to the invention of the steam engine and using coal to power machines. The second industrial revolution relates to mass production, the division of labor, and electric power. The third industrial revolution relates to the computer revolution, electronics, Information Technology (IT), and automated production. The fourth industrial revolution involves transformations in cyber-physical systems linked to technologies such as AI, networked society, 3-D printing, nanotech, quantum computing, etc. Over the centuries, design education had to adapt and shift to respond to new opportunities and areas of societal concern that emerged in each industrial revolution. What role might technology and Artificial Intelligence (AI) play in design education? Especially with generative AI?

**Diversity, Equity, Inclusion, Belonging, and Justice (DEIBJ)** concerns reached mainstream consciousness for many in the United States during the anti-racist Black Lives Matter protests following the 2020 George Floyd murder by police. More generally, the "decolonizing design" critiques targeted design education (e.g.,[7]). Both of these areas are critical to unpack amidst the increasingly global flows of students pursuing design education in countries with histories of white supremacy (e.g.,[11]) and settler colonialism (e.g.,[12]), such as the United States, Europe, Australia, and so forth.

DEIBJ and "decolonizing design" [7] discourses require design educators to critically assess their teaching practices and institutional practices. Many questions abound. What design discourses are privileged; what design discourses are underrepresented? What design histories might students learn? How might a broader range of design discourses be offered? What historical roles might design have played in colonialism and exploitation? How representative are the faculty and staff of the student body they serve? What might a "learning journey" look like in a design school to engage with topics such as "design for the pluriverse"[8], "decolonizing design" [7], and DEIBJ (e.g.,[13])?

How might design school faculty respond to such societal challenges? How might schools anticipate changes disrupting the current design education status quo? How might organizations discern what needs to change and remain the same? How might diverse faculty members productively engage in the challenges of change? In the next section, I describe different perspectives on possible futures.

### 1.2 Where Does One Stand on Possible Futures?

Frederik Polak wrote a book called "The Image of the Future" in 1961 [14]. Polak argued that two dimensions matter for the future: essence and influence. First, in essence, people can be optimistic or pessimistic about different kinds of futures, and second, they can imagine their influence on the future to be positive or negative. Peter Hayward suggested a 2x2 matrix to capture the four perspectives about the future and people's perceptions of their influence. Four views on the future emerge: (a) The world is getting better, and I have much influence; (b) the world is getting better, and I have little influence; (c) the world is getting worse, but I have much influence to make it better, and (d) the world is getting much worse, and I have little influence. Peter Hayward and Joseph Voros developed the Polak Game [15], as an interactive version of the four tendencies about the future described by Polak, where people position themselves concerning essence and influence—highlighting within an organization both individual and group dynamics. In the next section, I describe why change is difficult.

### 1.3 Why Is Change So Difficult?

Change is difficult for anyone. Many people may perceive unwanted change as threatening their identity, culture, and community. According to the stages of change framework, people go through various stages of change (e.g., pre-contemplation, contemplation, planning, action, maintenance, disengagement) before consistently changing behaviors [16]. (a) In the *pre-contemplation* stage, people are unaware that there is a problem. (b) In the *contemplation* stage, people realize the problem but are unsure what to do. (c) In the *planning* stage, they make plans. (d) In the *action* stage, people enact their plans. (e) In the *maintenance* stage, people can consistently enact the changes. People can *relapse* into the prior states at any point.

I mention the stages of change framework because creating a consensus to change a curriculum requires faculty agreement there is a problem with the current curriculum, exploring possibilities, planning a revised curriculum, setting the curriculum into action, and continually updating the curriculum.

### 1.4 Where Does Change Come From?

Change often begins at the periphery of disciplines, where innovators and extreme users view emerging issues as opportunities [17]. Everett Rogers' diffusion of innovations theory posits five stances on how people (and organizations) respond to change [18]. (a) *Innovators* take risks with new ideas that ultimately may fail; (b) *Early adopters* are opinion leaders who advocate for adopting new ideas; (c) *Early majority* adopt something after the *innovators* and *early adopters* but seldom are opinion leaders. (d) *Late majority*, adopts an innovation after the average participant and tends to be skeptical of an innovation; (e) *Laggards* adopt innovations last, cling to tradition, shun agents of change, isolate from more significant societal dynamics, and have limited networks.

Diverse perspectives likely exist in any organization. *Innovators* are prone to embracing change, and *laggards* resist it. Others may be oblivious to change happening or downplaying it. Why might people downplay unwanted change as a potential issue? Acknowledging unwanted change means that one must also decide how to respond appropriately [19]. Denial is effortless; transformation is effortful. Addressing problems (and opportunities) is exacting work, risky, and uncertain.

High-performing, innovative organizations continually scan for emerging issues and new opportunities. Reactive stances instead involve waiting for change to go mainstream first. Hasty, unreflective, reactive responses may miss more profound opportunities. *Laggards* instead tend towards reactionary nostalgia. How might organizations with diverse perspectives co-create shared direction and purpose?

### 1.3 How Might "We" Engage with Challenges Together?

In a majority assimilationist culture, there's often encouragement for minorities to "read the room," adapt, and fit into the majority views. Unfortunately, strong assimilationist cultures may miss emerging innovation opportunities linked to diverse perspectives. How might fragmented perspectives coalesce into diverse, equitable, and inclusive group visions? The preconditions for this shift involve the collective desire to create inclusive and collective visions, a "big tent" embracing diversity. Five steps include: (a) Acknowledge: Recognize the problem, challenges, or opportunities. (b) Learn: Understand the issues at hand. (c) Plan: Create a strategic plan. (d) Execute: Implement the plan. (e) Engage: Maintain commitment and adapt as needed. Next, I explore faculty perspectives on emerging key issues.

### 2. Visualizing the Learning Spaces for 21st-Century Design Education

How might we visualize such learning spaces? First, I explore these two dimensions with a 2x2 matrix with two axes: Climate Disasters engagement and AI. Four alternative futures result (figure 1a).



| Future 1 | Future 2 |
|---|---|
| Traditional Design Education | High-tech status quo |
| Future 3 | Future 4 |
| Luddite Climate Engagement | Technology for Climate Change |

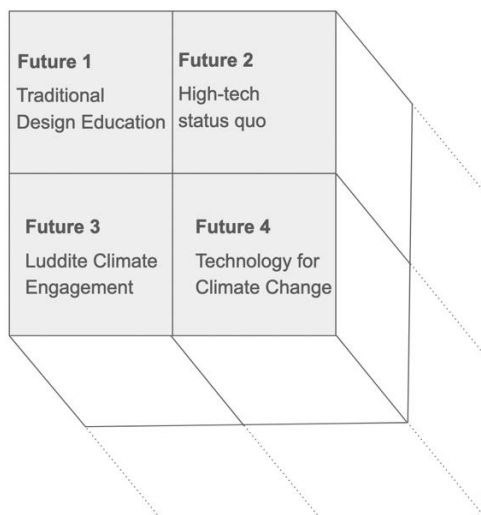| Future 5 | Future 6 |
|---|---|
| DEIBJ and Traditional Design | DEIBJ and High-Tech Status Quo |
| Future 7 | Future 8 |
| DEIBJ and Luddite Climate Engagement | DEIBJ and Technology for Climate Change |

Figure 1a. (left) futures 1-4 emerge with engagement with climate disasters (yes/no) and technologies like AI (yes/no).
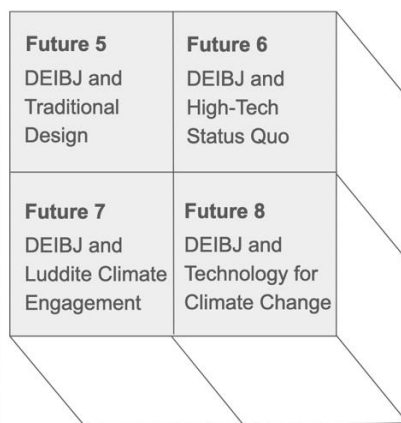
Figure 1b. (right) The alternative futures five, six, seven, and eight emerge from adding DEIBJ. (Images © LEL)

Future 1 is the "business as usual" traditional design education. (e.g., No meaningful engagement with AI or the unfolding Climate Disasters. Future 2 is the High-Tech Status-Quo (e.g., engagement with AI but not Climate Disaster). Future 3 is Sustainable Luddite design (e.g., Engagement with Climate Disasters but ignoring changing technology such as AI). Future 4 is focused on AI for the Climate Emergency, using advanced technologies to engage with zero-carbon lifestyle transitions.

Second, adding DEIBJ on a third axis to the four futures described above gives us Futures 5-8 (figure 1b): Future 5 focuses on DEIBJ within Traditional Design Education (i.e., no AI or Climate Change + DEIBJ). Future 6 focuses on *DEIBJ for High Tech Status Quo, which* is engagement with DEIBJ and technological change such as AI that ignores the Climate Disaster-related issues. Future 7 (DEIBJ for Luddite Climate Futures) is engaged with climate disasters and DEIBJ but ignores rapid technological changes such as AI. Future 8 (DEIBJ + AI + climate) uses advanced technology to engage with zero-carbon lifestyle transitions and social innovation, focusing on DEIBJ. I conceptualized these eight possible futures for design education to map where people position themselves.

## 3. Methods

Students, faculty, and staff received the online survey via email distribution lists. Respondents answered six questions on climate disaster, rapid technological change, and DEIBJ. For each question, there is an open-ended text box to voice other aspects not covered in the fixed response questions.

The first two questions are based on Fred Polak's *The Image of the Future* book to gauge how optimistic/pessimistic people are about it and how capable they feel about affecting the future [14][15]. (a) Do you see the world improving or worsening in the next ten years? (b) How capable or incapable do you feel of personally affecting the future? The second set of questions explores where people stand on emerging topics of interest across the university. (c) How interesting or uninteresting are the following topics to you personally? (d) How actively engaged or disengaged are you with the following topics? The third set of questions explores the current teaching comfort and frequency in design courses with emerging topics. (e) How comfortable or uncomfortable were you in engaging with the following topics in your design courses this semester? (f) How frequently did you engage with the following topics in your design courses this semester? The responses to the survey provide glimpses into how engaged or disengaged faculty and students are with the topics of climate disaster, rapid technological change, and DEIBJ. Next, in the results section, I visualize where people position themselves with these issues.

## 4. Results

I sent the survey to various distribution lists: the student distribution list with 250 students (undergraduate, master, and doctoral students), the faculty distribution list included thirty-three full-time faculty, three special faculty, and forty-one adjunct faculty members. Thirty-seven people responded to the survey. The response rates reported for the survey were 11% overall (Tenure track faculty 59%, Teaching track faculty 50%, Special track faculty 66%, Doctoral Teaching Fellows 71%, and Students 3%). Next, I discuss the results in three sections: outlook on futures and influence, personal engagement with emerging areas, and current teaching around emerging issues.

### 4.1 Outlook on Futures and Personal Influence
The outlook for the next ten years varied from better to worse (figure 2a), and personal impact ranged from capable to incapable (figure 2b).
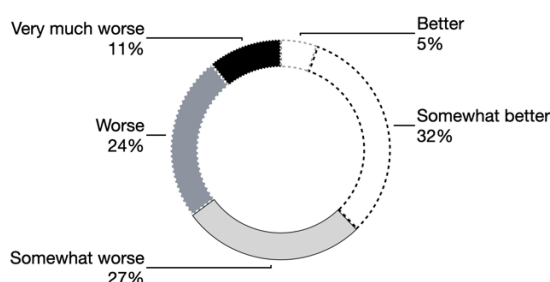


Figure 2a (left) Responses to "In the next ten years, do you see the world as getting better or worse?" on a six-point Likert scale.
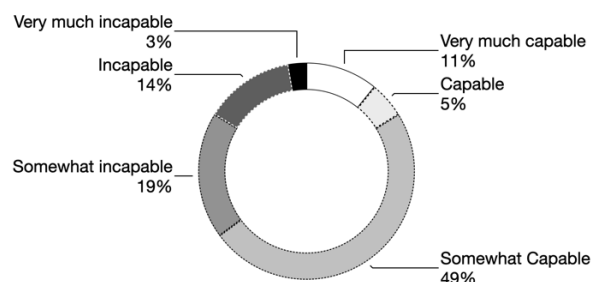
Figure 2b (right) Responses to "How capable or incapable do you feel of personally affecting the future?" a six-point Likert scale. (Images © LEL)

The vast majority of respondents (62%) said the future is getting "somewhat worse," "worse," or "very much worse" in the next ten years (figure 2a). The vast majority of participants (65%) felt "somewhat capable," "capable," or "very capable" to affect the future (figure 2b).

I coded the six levels of "better/worse" and "capable/incapable" into binaries to provide four overviews: (a) Future Better & Personally Capable, (b) Future Worse & Personally Capable, (c) Future Better & Personally Incapable, and (d) Future Worse & Personally Incapable.

Figures 3a and 3b combine the two previous questions on the future (better/worse) and personal agency (capable/incapable) by role. Figure 3a shows the distribution across the four areas. Figure 3b shows the distribution by role. Notice the distribution by role: tenure track faculty, teaching/special faculty, adjunct faculty, doctoral teaching fellows, students, and staff.

Figure 3a illustrates where people landed in the four quadrants. Close to two-thirds of all participants said they could impact the future in ten years (half of which said the future would be worse, and the other half better). Close to one-third of participants said the future was worsening, and they could not improve things.

The distributions by role in Figure 3b (right) are quite different by role. Approximately two-thirds of tenure track professors expressed a "capability" to shape the future but split on whether the future is getting better or worse. The approximately remaining third, tenure track professors, said they were incapable of shaping the future (and two of three thought the future was getting worse). All five teaching track and special faculty respondents said the future is getting worse. Four of the teaching track and special faculty said the future is getting "worse" and were "incapable" of shaping the future as opposed to one who said the future is getting "worse," but they were "capable" of shaping futures. Two-thirds of Doctoral Teaching Fellows said the future is getting "worse" but that they were "capable" of affecting futures. Some tenure track professors and doctoral teaching fellows' research on long-term transition design and sustainability might explain their stated "capability" to influence futures.
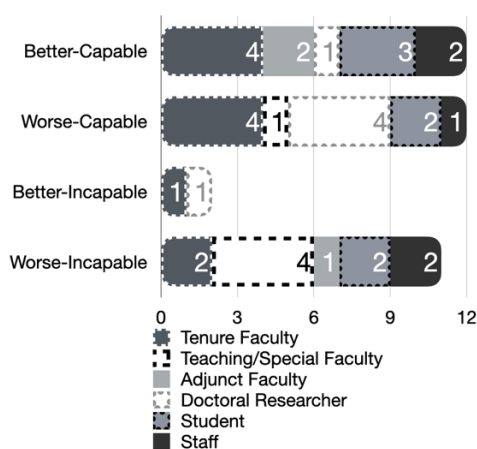


Figure 3a (left) shows the four areas: better-capable, worse-capable, better-incapable, and worse-incapable. The patterns represent roles.
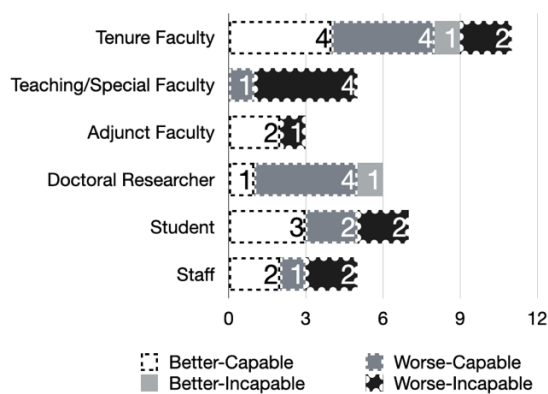
Figure 3b (right) shows the breakdown of the four areas: better-capable, worse-capable, better-incapable, and worse-incapable by role.
(Images © LEL)

### 4.2 Personal Interest and Engagement with Design and Emerging Areas

Two questions sought to measure participants' interest and engagement with traditional, experimental, and emerging topics in design with a five-point Likert scale (1=Very [uninterested, unengaged], 2=[Uninterested, unengaged], 3=Neither, 4=[Interested, Engaged], 5=Very [interested, engaged]) (figure 4). Unsurprisingly, on average, participants were interested in traditional and experimental design. Likewise, mean interest in emerging topics such as SDGs, Zero-Carbon Lifestyle transitions, rapid tech change, Synthetic Bio-Technologies, DEIBJ, "decolonizing design," and "design for the pluriverse" fell between *Neither interested nor disinterested* and *Interested*; mean Synthetic Bio-Tech was *unengaged.*

### 4.3 Comfort and Frequency of Teaching Design Topics

Next, I describe comfort with teaching and the frequency of teaching a series of design topics ranging from traditional design to synthetic bio-technologies like DNA editing with CRISPR. Unsurprisingly, on average, respondents were *neither comfortable nor uncomfortable* with teaching all topics except synthetic bio-technologies (e.g., DNA editing with CRISPR), which was predictably in the *uncomfortable* range (figure 5).

Predictably, the frequency of teaching for traditional and experimental design practices, on average, fell between *A good bit* and *Usually*. As expected at a Tier 1 Research university with a strong technology reputation, Rapid tech change (e.g., AI, XR, W3) fell between *sometimes* and *a good bit.* DEIBJ, too, fell between *sometimes* and *a good bit.* Despite the apparent comfort in teaching topics like SDGs and Zero-Carbon Lifestyle Transition, the frequency fell closer to *rarely; the* frequency of teaching "decolonizing design" and "design for the pluriverse" averaged close to *sometimes.* Respondents mentioned that the frequency of teaching synthetic bio-technologies (e.g., DNA editing with CRISPR) was close to *never.*
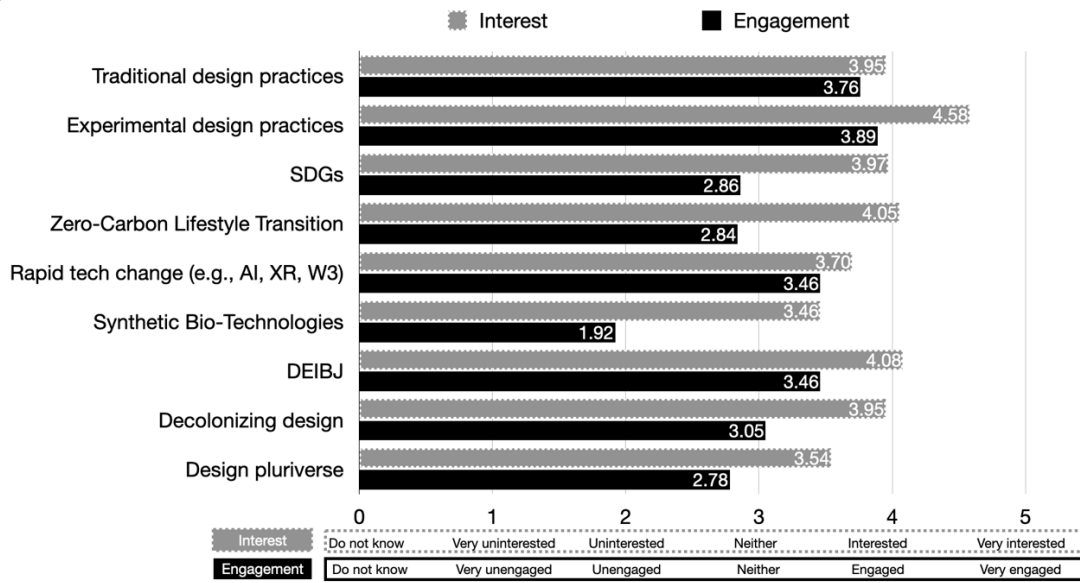
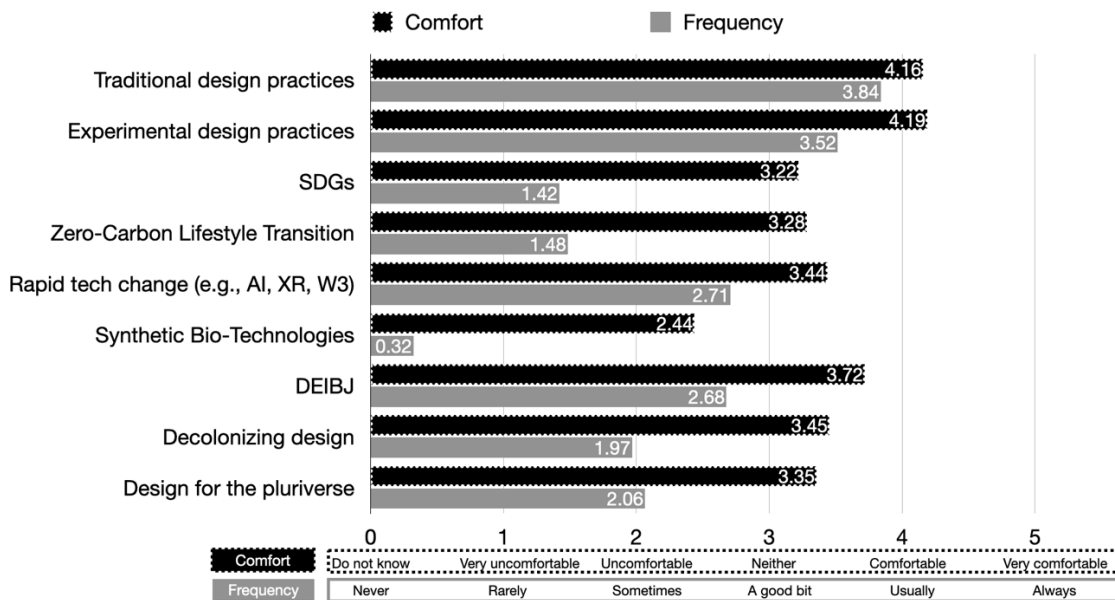Figure 4. Personal interest and engagement for all participants. (Image © LEL)



Figure 5. Comfort and frequency of teaching for all faculty, doctoral teaching fellows, and students.
(Image © LEL)

## 5. Discussion

The discussion section unfolds in five sections: (a) outlook on futures and personal influence, (b) personal interest and engagement, (c) Comfort and frequency teaching design topics, (d) deepening alternative futures, and (e) future work.

**Outlook on futures and personal influence** Caution is needed; only 59% of tenure track faculty responded. When combining the two questions of outlook on futures and personal influence by role, 36% of tenure track faculty saw the future as being better, and *they were capable of making a difference*. Meanwhile, the other 36% of faculty saw the future as *worsening* and said *they could make a difference*. The remaining 27% of tenure-track faculty said they were *incapable of influencing the future*, whether for better (9%) or worse (18%) (figure 3b). Tenure track faculty and doctoral teaching fellows' capability to influence futures likely resides in their research focus outlook. I wonder how the perceived capabilities for influence increase for all faculty. What initiatives might support such learning?

**Personal interests and engagement:** On average, respondents were more "interested" in the topics than "engaged." The smaller the gaps between perceived "importance" and actual "engagement" were for traditional design, experimental design, and rapid tech changes (figure 4). The more significant the gap between interest and engagement can be interpreted as lower priorities. The differences between interest and engagement were most telling in the *unengaged* ranges for SDGs, Zero-Carbon Lifestyle transitions,

and Design for the Pluriverse. Synthetic Bio-Technologies were in the *unengaged* range. Given the institutional emphasis on DEIBJ at Carnegie Mellon University, respondents rated DEIBJ in the mid-point of *neither engaged nor unengaged*. DEIBJ's adjacent topics of "decolonizing design" and "design for the pluriverse" were rated much lower than DEIBJ. I interpret the differences observed as the impact of university, college, and school administrators' stated commitments to DEIBJ (but not explicitly endorsing "decolonizing design" and "design for the pluriverse" as priorities). Further research is needed to understand why the more significant interest and engagement gaps exist (figure 5).

**Comfort and frequency teaching design topics** Given the unfolding climate disaster, it was surprising to notice pronounced differences between "comfort" teaching and actual "frequency" teaching. On average, faculty said they were *neither comfortable nor uncomfortable* teaching Sustainable Development Goals and Zero-Carbon Lifestyle Transitions. However, on average, faculty taught between *rarely* and *sometimes* SDGs and zero-carbon lifestyle transitions. How might the University Administration, College of Fine Arts, and School of Design implement SDGs and Zero-Carbon Lifestyle Transitions as strategic priorities to increase teaching engagement? One faculty member commented:

> *The world is spiralling out of control, and few people care about that; most are in denial. My greatest frustration is that universities are probably in the most powerful position to steer change, and yet we fumble around doing virtually nothing. For me, this kind of academic apathy is the darkest part of the situation: to be fully aware of the crisis yet continually fail to act.*

I interpret the survey results to signify that multiple futures co-exist within the School of Design. Traditional design, experimental design, and changing technologies are current foci. Faculty said they *sometimes* taught DEIBJ, "decolonizing design," and design for the pluriverse. Respondents describe their "comfort" levels in teaching topics like sustainable development and zero-carbon transitions, but they *rarely* taught them on average. Another faculty member commented:

> *How might continuous learning for societal challenges such as climate change and SDGs become embedded into faculty learning and teaching? How might critical areas of societal concern emerge as design priorities that cross-pollinate with traditional design excellence?*

More research is needed to determine pathways forward for urgent areas of societal concern.

**Deepening alternative futures perspectives.** The eight alternative futures described were developed with three axes of uncertainty in design education around Climate Change (e.g., zero-carbon lifestyle transition), rapidly changing technologies such as AI, and engagement with DEIBJ (decolonial design and design for the pluriverse). The resulting eight possible future worlds need further exploration.

How might such sketched-out futures be deepened in meaningful ways? Next, I describe two ways: through ontology and epistemology and deepening understanding of reality through Causal Layered Analysis. First, epistemology and ontology deepen one's understanding of each future. Epistemology tells us what counts as knowledge and truth in each future. Ontology is the study of being and gives us insights into what it means to exist in each future. Second, how might one imagine in depth each future? The futures method, Causal Layered Analysis, developed by Sohail Inayatullah, provides a four-layer framework to analyze each future [20]. (a) What behaviors are typical in each future? (b) What infrastructure and social systems support such behaviors? (c) What worldviews describe each future? (d) What stories, myths, and metaphors encapsulate each future?

**Future work** is needed to deepen understanding of individual faculty interests and co-create collective visions. Interviews can clarify perspectives, worldviews, and future-related dreams for design education. Group workshops surface diverse perspectives evidenced in the future outlooks (better/worse) and one's futures agency (capable/incapable) and develop a shared focus and direction. Given the urgency of design teaching for topics like climate disasters, SDGs, and zero-carbon transitions, creating a supportive environment for learning communities is critical. Likewise, it is vital to understand how individual and collective discourses within the School of Design and the leadership team aligns through continuous foresight efforts [21] with the priorities of the College of Fine Art and University administration. The student survey response rate was 3%. Further work is needed to understand current student, alumni, and industry partner perspectives. Design's ethical dimensions requires exploration.

### 6. Summary

The world is rapidly changing; design education must adapt to urgent existential challenges. An online survey at the School of Design at Carnegie Mellon University asked faculty, staff, and students for their perspectives on three areas of change: unfolding climate disaster, rapid technological change, and DEIBJ. The survey had three sections: (a) Personal perspectives on futures ten years out (better/worse) and capability to influence the future; (b) Personal interest and engagement with emerging topics; and (c) Comfort teaching and frequency of teaching emerging topics. A vast majority of participants (62%) said the future was getting "somewhat worse," "worse," or "very much worse" in the next ten years (figure 2a). The vast majority of participants (65%) felt "somewhat capable," "capable," or "very capable" to affect the future

(figure 2b). Approximately two-thirds of tenure track professors expressed some "capability" to shape the future but split on whether the future is better or worse. The approximately, remaining third of tenure track professors said they were incapable of shaping the future (and two out of three thought the future was worsening). Two-thirds of Doctoral Teaching Fellows said the future is getting "worse" but that they were "capable" of affecting futures. Such perspectives are likely outcomes of engagement with transition design and sustainability-related research. Future work should increase urgency (and action) on campus and the ethical dimensions of design education should be addressed.

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