Eliciting Tech Futures Among Black Young Adults: A Case Study of Remote Speculative Co-Design

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ABSTRACT

The question of who gets to contribute to design futures and technology innovation has become a topic of conversation across HCI, CSCW, and other computing communities. This conversation has grave implications for communities that often find themselves an afterthought in technology design, and who coincidentally could benefit most from technological interventions in response to societal oppression. To explore this topic, we examined "futuring" through co-designed speculative design fictions as methods to envision utopian and dystopian futures. In a case study, we examined technology's role in the imagined futures of youth participants of a Chicago summer design program. We highlight emerging themes and contribute an analysis of remote co-design through an Afrofuturism lens. Our analysis shows that concepts of utopian futures and technologies to support those futures are still heavily laden with dystopian realities of racism and poverty. We discuss ways that speculative design fictions and futuring can serve to address inclusivity in concept generation for new technologies, and we provide recommendations for conducting design techniques remotely with historically excluded populations.

CCS CONCEPTS

• **Human-centered computing → Empirical studies in HCI**; • **Social and professional topics → Race and ethnicity**.

KEYWORDS

participatory design fictions, speculative design, design workshops, co-design, Afrofuturism

1 INTRODUCTION

The subject of who gets to engage in the speculation and design of futures has become an important conversation across the HCI and CSCW computing communities [78, 86, 89, 94]. Researchers have considered the ways that traditional design practices have become exclusionary [10, 14, 26, 31], and in some instances harmful [65, 67], given the impact of homogeneous samples [40] and methods that neglect those traditionally marginalized in society. As the United States faces the interwoven pandemics of COVID-19 (the disease caused by the 2019 SARS-Cov-2 virus) and existing racism that has surfaced through overt police brutality, there is increased urgency to consider who contributes to the design of technologies that directly impact marginalized communities.[1] Such pandemics impair and kill Black[2] and brown people living in the United States at higher rates than whites [69, 100], and both are amplified by technologies such as contact tracing, facial recognition, and social media [61]. Social scientists documenting and examining this moment assert that there is no way to critically analyze the gravity of this time, our nation's response, or potential solutions *without* considering the intersection of race and class [18, 23, 88]. Similarly, when considering technological interventions intended to address societal inequalities, we must also attune to race and class as constructs of experience and engagement. HCI, CSCW, and other computing communities examine, design, and deploy varied technologies based on machine learning, which perpetuates discrimination, forms of racial profiling, and exploitation [1, 16, 38, 44, 82, 93] and thus must consider inclusive methods that might eliminate harmful practices.

"Futuring" in design through methods of speculative design, design fictions, or radical co-design considers alternatives of desirable and undesirable worlds by speculating to immediate or distant futures [13, 30, 45]. Through futuring in design, researchers examine how innovations in technology might positively or negatively impact our interactions with one another or the environment around us. Collaborative approaches to this method also allow for novice designers to consider individual or collective futures by placing themselves directly in design engagements and exploring both context and concept. As literature across HCI and design build a discourse around the nexus of co-design and futuring, we find that groups marginalized along race and class are *still* considered less frequently in the design of newer technology [40] and are not well represented in design methods. Such exclusion threatens technology adoption because people will not consume technologies that they feel are not intended for them. This exclusion is often discussed in relation to the digital divide, which results in certain groups including lower-income and ethnic minorities having lower technology proficiency and literacy. This is particularly detrimental

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[1]We identify marginalized populations as those who have been disenfranchised and historically oppressed in the United States due to race, class, ability, sexual orientation or identity, or citizenship.

[2]We acknowledge the social identity of this racial designation by capitalizing the word Black throughout our text. Several style guides including that of the American Psychological Association now recognize Black as an adjective to describe a community with a capital 'B'. [24]

amid a pandemic where remote participation is required for education, health care, and employment, all of which are essential for our well-being. Thus, it is important to consider both who has access to conceptualizing new alternate technological futures and cultural structures which define creativity and ingenuity.

Speculative design as an HCI method expands how technology is conceptualized and what realities are imagined by considering alternative futures. Similarly, co-design and design workshops offer opportunities for diverse communities of people to conceptualize their futures and the role of technology in those futures. However, a pressing concern across HCI methods is *who* is allowed to participate [86] in these design activities. Similar concerns exist regarding *whose* visions are represented in concept generation and futuring. As design methods continue to extend into being more virtual and remote, we must also understand how newer approaches within design research support co-design and futuring among marginalized groups. Thus, we consider what's required for remote participation and build upon the existing research in both areas [54, 55]. To hear from voices who are traditionally absent in the speculation of newer technologies, we present a case study that explored the promise of co-design and speculative design among youth in a Chicago summer design program. Drawing from Ruha Benjamin, a Princeton professor of African American studies, "one way of experimenting with alternatives to the racist status quo is by employing speculative methods" [9]. Therefore, in partnership with a local arts engine, we engaged with speculative design and co-design to elicit technological futures among youth and young adults in Chicago.

A profound question that arose from our research is this: How can one imagine a technology that exists in a world without racism if one has never experienced a world without it? We found that students' utopian fictions were not absent of societal challenges such as racism or poverty despite acknowledging how these constructs contribute to the oppression of communities. Second, our results led us to consider design more broadly. Most design inquiries require us to engage people outside the context of our design ethos from an academic or practitioner perspective. However, how well are we taking into consideration that our realities aren't everyone's realities? How much have we as academics and practitioners been thoughtful about the fact that racial climate is critical or detrimental to how futures are considered and the way that technology is considered as part of those futures? And how well does speculative design and approaches to futuring consider cultural structures that impact the ways concept generation is perceived? Our contributions can be characterized as empirical and methodological. Empirically, our results contribute: 1- An understanding of elements that speak to visions of technological utopias envisioned to take place post-pandemic; and 2- An understanding and critical reflection of the ways marginalized youth contribute to technology futures. We also contribute new methodological innovations that engage marginalized youth in remote co-design as a way to elicit more inclusive technological futures.

2　RELATED WORK

Our case study builds upon the concept of "futuring" through speculative and co-design methods. Below, we review existing HCI and design literatures, which have employed these concepts and methods. We situate our work in these areas and contribute an approach to eliciting futures from marginalized youth. We provide a brief overview of futuring in HCI, as well as methods to elicit visions of futures among marginalized groups, and we discuss the ongoing expansion of remote qualitative design research across HCI and CSCW.

2.1　Futuring in HCI

The notion of futuring has grown in interest among the HCI community as a way to consider alternative worlds and future technologies that support ideal social contexts [49]. Scholars have theorized concepts such as speculative design, critical design, and others that draw designers and users into thinking about future existences. Speculative design aims to provoke analyses of the impact that designed objects, like fictions, have on our lives [6], and to collectively imagine, discuss, and debate what a preferable future might be (e.g., [28]). Speculative design methods such as design fictions allow people to suspend their beliefs to imagine what can be, and to articulate these ideas to speculate technology concepts. In a study of sustainable domestic energy consumption, Prost et al. asserted that design fictions help us to envision desirable or undesirable futures by tapping into our current concerns [71]. Design fictions are useful to translate radical visions into design implications, and include social, political, and cultural dimensions that are valuable to design. Researchers suggest that design fictions demonstrate both the concept and the context simultaneously, making them a popular approach to engaging various communities in futuring across HCI [49].

Co-design often involves the futuring that is seen in speculative design because it is an engagement where individuals envision future technology design in collaborative groups or with designers. Co-design can facilitate "critical engagements", where people question current beliefs of technology, and create new and imaginative ways to think about a problem or solution [27], thereby engaging in technology futuring. Ambe et al. conducted co-design fiction workshops with older writers to inspire discussion and imagination about the future of tracking and monitoring older people [3]. Researchers determined that eliciting design fictions in a collaborative setting allowed older writers to build upon one another's stories while maintaining personal narratives. Baumann et al. explored the use of collaborative design fictions and found that they lend well to addressing sensitive societal topics where there might be conflict [7]. Similarly, Cheon et al. determined that collaborative design fictions might successfully challenge conflict that arises in the HCI co-design process by bringing together community [21].

The tools and activities that constitute speculative design are also part of the larger conversation about how we engage futuring in HCI [8, 41, 75]. Speculative and design fiction probes are valuable tools in the elicitation of imaginative thinking and critical reflection about technology futures. These probes can be tangible artifacts, games, or low-fidelity paper workbooks that elicit critical narratives and open-ended responses from potential users [75]. As an example, Hoang et al. found that using a design workbook as a speculative design probe encouraged *"out-of-the-box thinking"* and concept generation [41], and should be considered part of futuring methods.

Speculative design also has its shortcomings. Because it has been practiced and theorized largely within the privileged walls of universities in wealthy countries [59], it fails to mention diverse oppression in capitalist, heteronormative, sexist, racist and classist societies [58]. Many contributions have made such privileges visible and acknowledged the need to amplify voices of the most marginalized and vulnerable individuals. Following such evaluations, Nägele et al. raised the importance of considering diverse perspectives, especially those who are most impacted by future outcomes [63]. Researchers acknowledge the necessity to re-imagine co-design methods to be more equitable [36, 91], acknowledging this as an approach to create more inclusive opportunities for conceptualizing individual and community futures. Despite these critiques, speculative design has not been widely explored among marginalized groups. A further examination of co-design might support new populations in envisioning futures and understanding technology's role in them. We inherently address how to improve upon speculative co-design to be more inclusive, particularly among marginalized youth.

2.2 Speculative Design with Marginalized Populations

Marginalized populations are very rarely, if ever, represented in popular scenarios of technology design fictions (e.g., [92]) or in speculative critical design [64]. As suggested earlier, the needs of white affluent citizens from financially-wealthy countries are at the center of such scenarios [84]. Historically, writers such as Octavia Butler and N. K. Jemison have contributed to the area of speculative fiction and the concept of futuring as a part of the Afrofuturism genre, yet there has been very little evidence of speculative critical design work that considers or includes marginalized voices in the way we attribute technology design fictions in HCI. Therefore, to create a more democratic future, we must consider design fictions and technological concepts from diverse communities to inform technology conceptualization and consider their voices in the ethos of speculative design [81].

Scholars such as Woodrow Winchester have advocated for HCI's engagement with speculative design from a lens of Afrofuturism as a way to motivate design decisions that lend to inclusive and impactful design futures for marginalized populations [94, 95]. When considering where inspiration for technology stems from, Afrofuturism "facilitates a more empathic design engagement that explicitly places the disenfranchised Black voice central in the design narrative, with an intent of universal betterment through and by technology" [94]. Afrofuturism is situated to provide a more empathetic design engagement when compared to traditional speculative design approaches. Diverse orientations to the needs and use of technology become a valuable way to conceptualize technologies to address disparities and inequities [77]. In this way both the method and the result of speculative design becomes more expansive to those considered, adding to the ongoing conversation of "Who gets to future" [86].

Researchers have found success engaging marginalized groups in co-design to identify innovation among existing and non-existing technologies [3, 37, 98] and have called for a more critical reflection of co-design methods used with these populations [36]. Research

engaging youth from marginalized communities in speculative co-design may also be thought of in the same sense—an area of HCI that requires constant reflection and adaptation of methods. Specifically, creating caring and inclusive environments among our research praxis could have profound benefits for the ways we are able to understand technology futures [83]. Although children are often engaged in co-design activities, youth from marginalized populations are often not engaged because of a lack of exposure and access to many design programs [90]. In a study assessing equity and equality in co-design, researchers asked students of affluent backgrounds and students from areas with limited resources to design a school of the future using cooperative inquiry [90]. The students with affluent backgrounds designed schools that had a sprawling landscape, whereas students from lower-resourced areas described buildings similar to what they were used to seeing. Researchers asserted that establishing inclusive co-design teams might help to create diverse perspectives in design concepts and speculative technologies [90].

While researchers and designers have used futuring and co-design in areas as diverse as health, creative work, and daily life [7, 20, 21, 41], research that engages young adults (i.e., ages 18–24), particularly those from marginalized populations, is rare. Thus, to explore and elicit their values and visions of technology futures in the time of COVID-19, we engaged with youth living in the South Side of Chicago in a series of speculative co-design workshops. Further, our design sessions were done remotely and offer a response to the open question of how to conduct remote co-design sessions [55].

2.3 Extending Co-Design Methods for Remote Engagement

The expansion of data collection methods in design research is a source of innovation and scientific exploration among HCI researchers [15, 52, 54, 55, 80]. Often the tools that we study are feasible as data-collection platforms, which can in turn make traditional design research methods more accessible. Such platforms should be considered for conducting remote co-design research. Remote engagement in computing research has effectively built rapport between researchers and participants, allowed individuals to respond to design prompts in a convenient manner, and extended the reach of data collection methods [54, 55].

Today's global pandemic necessitates new approaches to data collection to maintain social distancing. Thus, we must understand the feasibility of online and videoconferencing tools, particularly for populations that are traditionally underrepresented [55, 99]. Social scientists assert that the Zoom platform is a viable alternative to in-person qualitative data collection, and in some cases the preferred medium compared to face-to-face, telephone, or other remote interviewing methods [4, 50, 51]. In a study conducted among practice nurses, participants and researchers thought that Zoom was simple and easy-to-use and allowed individuals to develop rapport with one another [4]. This method supports social distancing and extends the reach of traditional qualitative research to marginalized populations [87]. In assessing participant experiences with this method, researchers found that participants preferred smaller

focus groups but that larger groups produced more ideas that were considered unique and relevant [51].

Despite the success of this method in the social sciences, HCI researchers have not successfully adapted in-person design or co-design methods to an online environment. HCI researchers have attempted to address these challenges with the asynchronous remote community (ARC) method. The ARC method facilitates online, web-based focus group discussions, and needs assessments for new technological innovations through message boards and group chats [53, 54]. The ARC method allows for engagement in co-design at the convenience of individual community members and allows researchers to monitor engagements remotely. However, the inability to engage participants in interactive activities at the same level as in-person co-design is a known limitation. Nevertheless, our case study extended this past work by examining remote co-design among Black young adults as a way to speculate technology futures.

3 BACKGROUND

In this section, we provide background about the city of Chicago and the local Arts Incubator and Design Apprenticeship Program which frames the relevance and importance of this study.

3.1 Social Context: Chicago

Our research is situated in the context of Chicago, one of the most densely populated cities in the Midwestern United States. Despite it being the home of many technological, academic, and business advancements, it is one of the most segregated cities in the country [66, 76]. Neighborhoods in the North Side and central downtown of the city are inhabited by primarily white residents, while the South and West sides of the city are inhabited by primarily Black and Hispanic residents. The median annual household income of the city is $55k, with 32.0% of Black residents and 21.5% of Hispanic residents earning less than the median income and experiencing poverty [17, 43]. Segregation in the city creates a divide in both digital access and proficiency, which leaves many lower-income ethnic minority neighborhoods in conditions where they experience lower digital access [22, 33]. In many cases, communities with lower digital access and lower reports of technology proficiency are the minority in higher-skilled tech jobs, which include jobs in technology development and jobs that require technology for productivity [73]. Chicago is one of the many cities in the United States where Black communities are disproportionately impacted by both the ongoing global health pandemic of COVID-19 and the political uprising as a response to state violence against Black people. Further, the loss of work after the COVID-19 pandemic disproportionately impacted lower-wage earners, those with lower education, and racially minoritized individuals [34]. As the city faces the impact of these multiple, interrelated pandemics, community organizations have sought ways to provide direct aid and to re-imagine spaces and community programming to compensate for lost jobs and inadequate government aid, and access to food.

Historically, Chicago has had visible disparities in its allocation of city resources between North Side neighborhoods and South Side neighborhoods. Most notably, the disparity in the allocation of resources is a result of redlining and other systemic practices that have directly impacted Black and brown neighborhoods. Local

artist and journalist Tonika Johnson has spent years chronicling disparity and inequity in Chicago along lines of race and class in her Folded Map Project using the city's mapping system [56]. Johnson's Folded Map Project is one of many visual investigations of how neighborhood addresses on the South Side receive less investment in terms of city resources and infrastructure in comparison to mirrored addresses in the North Side [56]. The disparate dissemination of resources also impacts technology skills and employment readiness in the educational opportunities that are afforded to certain communities, although the entire city faces challenges in education funding. There is value in preparing marginalized communities with technology readiness, and envisioning future technologies might support the development of technology skills.

Community-based participatory approaches involve community partnership and center on community needs [47, 72]. As a part of our commitment to engaging in community-based design work and in the spirit of community-based participatory research, we partnered with an existing arts engine that was already invested in understanding equitable technology futures and building skills that re-imagine local communities.

3.2 Site Description: Arts Incubator and the Design Apprenticeship Program

We designed this study with a local arts engine run by a neighboring university. The Arts Incubator was established in 2013 by artist Theaster Gates in a 10,000 square-foot building in the Washington Park neighborhood after the building sat vacant for nearly 20 years. The building houses studio space, gallery and exhibition rooms, and a woodworking shop all open to its primarily Black patrons. The Arts Incubator's aim is to serve as a catalyst for neighborhood revitalization and community engagement, and thus it hosts a variety of community programs. One of the initiatives of this arts engine is to expose South Side Chicago students to arts, design, and entrepreneurial innovation through its Design Apprenticeship Program (DAP). The DAP was founded by local design professionals of the South Side and seeks to expose teenagers and young adults ages 14–24 to concepts and tangible skills related to design through mentorship and skills-building in preparation for creative careers in the workforce. Through action projects[3] and training development, students engage in a paid apprenticeship working with design mentors on action projects targeting a positive transformation of the neighborhoods that make up the corridor surrounding the arts engine.

We wanted to use speculative methods to elicit thoughts and ideas on the future of technology and design. We were specifically interested in how these young adults envisioned utopian futures of their local environment. Considering the need for social distancing, we also wanted to consider the impact of remote engagement on co-design. Therefore, in a series of co-design sessions we investigated the following research questions:

- In what ways does co-design support the generation of ideas for a utopian future for Chicago youth?

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[3] Action Projects are described by the arts engine as active community projects where students apply design skills to produce tangible artifacts.

- What are Chicago youth's imagined utopian and dystopian futures and what is technology's role in these utopian and dystopian futures?
- How might design fictions as a method of futuring elicit new ideas that speak to Chicago youth's concepts of a post-pandemic utopian reality?
- How is speculative co-design impacted by remote engagement?

4 METHODS

Our case study took place from June 2020 to August 2020. All research staff and participants were geographically located in Chicago. Our study is tied to a larger ongoing research project interested in considering the historical vibrancy and richness of neighborhoods in the South Side corridor and using design as a catalyst to speculate and communicate the future of these neighborhoods. To address this research agenda, researchers worked with staff and instructors from the Arts Incubator to identify design activities that supported their existing summer DAP curriculum. The first author had an ongoing relationship with the Arts Incubator and previously conducted other research studies at this location.

The planning of the larger research effort began in the fall of 2019, with researchers and program staff identifying that summer would be the best time to engage youth in a series of design sessions. Staff at the Arts Incubator presented students with an overview of our project during enrollment and offered students an opportunity to engage. The project was presented as additional class sessions to complement their regular apprenticeship sessions. Researchers worked with program staff to develop curriculum for the design sessions that would mirror class structure and supplement methods and concepts already present in the curriculum. These sessions aimed to examine the ways in which students speculate the future of technology and their ideas for what dystopian and utopian futures of their city would entail. Because of the ongoing global COVID-19 pandemic, we adjusted our activities to being remote to observe social distancing. This also allowed us to explore and assess remote co-design. Thus, we conducted design sessions and activities over Zoom and mailed all physical materials to students before the start of our design sessions. Students were compensated for each design session in accordance with their apprenticeship pay rates. This research project was approved by the first author's institutional review board. Next, we discuss our design sessions, materials, and data analysis.

4.1 Design Sessions

We held a total of six virtual design sessions, which lasted approximately 2 hours each. We scheduled design sessions once a week for six weeks. We took time out in each session to allow for reflection so that we could adequately plan for subsequent sessions. We skipped one session to observe the Independence Day holiday and rescheduled another session to accommodate youth work schedules.

The first design session began with the reading and collecting of consent and assent among the DAP students and their parents. Once the first author collected assent and consent, the team provided each student with a link to an online survey to collect: demographics and

background information including education level, employment status, and technology and social media use; and responses to a digital competency questionnaire adapted from [2], which assessed technology proficiency, familiarity, and technical readiness. We wanted to get a sense of students' overall comfort with technology.

4.1.1 Session 1: Introduction. The first design session began with an introduction to the design workbook (we provide an overview of this workbook in the following section). We then provided an overview of concepts such as participatory design, co-design, speculative design, and Afrofuturism and asked students about their familiarity with these terms. To aid in these descriptions, researchers prepared three 2- to 3- minute video clips of speculative technologies as seen on the television show *Black Mirror*[4] that showed dystopian futures based on technological concepts. We chose clips that showed the context of social, surveillance, and memory technologies, and how they worked in a dystopian reality to help students get a gist of what technology futures might consist of. We followed each clip with a brief discussion about students' thoughts and feelings about the technologies shown. We then prompted students to identify their thoughts on elements that would be associated with dystopias and utopias. We asked students about these elements in the context of their Chicago environment. For each prompt, students were given 20–30 minutes to visualize their ideas in the design workbook and we then regrouped for discussion. During this time, students could elect to turn their camera and microphone off. At the end of the session, we guided DAP students through an "I liked, I learned, I wish"[5] exercise as a way to obtain feedback on the session's activities. Students were given the option to share their feedback verbally or write it in the Zoom chat box.

4.1.2 Sessions 2 and 3: Envisioning Utopian and Dystopian Futures. In sessions 2 and 3 we guided DAP students through conversations about envisioning utopian and dystopian futures and technologies that would appear in those futures. We first introduced students to various types of technology such as Artificial Intelligence, the Internet of Things (IoT), robotics, machine learning, autonomous vehicles, and facial recognition to provide context for the types of systems that might exist in future utopian realities. We then provided prompts that focused on envisioning technologies that would speak to a utopian future in their neighborhood and city. Students then discussed considerations for technology design to support a utopian future, with the researcher using a virtual Miro white board to facilitate brainstorming. During the second session, DAP students plotted both an individual utopian future and a utopian future for their local environment. The third design session focused on introducing students to storyboarding and having them work collaboratively to develop storyboards, scenarios, and design fictions to communicate their technology ideas. Each session concluded with students sharing their ideas and the "I liked, I learned, I wish" discussion.

4.1.3 Sessions 4 and 5: Ideation and Collaborative Design Fictions. Sessions 4 and 5 were designed to elicit details of student concepts through ideation and sketches, and to share their ideas. In

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[4]*Black Mirror* is a British science fiction anthology that examines the unanticipated consequences of new technologies.
[5]This is a design thinking activity intended to solicit quick methodological feedback.

session 4 students refined the scenarios they wrote about their envisioned technology and developed design fictions. For this session researchers structured activities for all DAP students to work collaboratively to envision details of their ideas and what it would look like for their technologies to exist in both our current reality and a speculated utopian future. In the fifth design session researchers went into a deeper discussion of co-design and participatory design and continued to engage students in collaborative storyboarding where students built off of one another's design fictions, intertwining their technology ideas. Again, we concluded each session with the "I liked, I learned, I wish" discussion.

4.1.4   Session 6: Report Out. We designed the final session so that participants could share their ideas and strategize potential ways to visually share ideas to a larger audience. To have impact beyond the research, Art Incubator researchers and staff brainstormed ways to share design session outcomes through a social media campaign that might showcase DAP student activities and contribute positive narratives of Chicago's South Side.

4.2   Speculative Probes

4.2.1   Co-Design Guide/Workbook. We developed a design workbook as a guide for eliciting speculative design fictions. Similar workbooks have been deployed as speculative design or design fiction probes with the purpose of jump-starting the design process and motivating co-designers to brainstorm unfamiliar topics [8, 32, 62, 96, 97]. Beignon et al. push this notion so far as to use the design workbooks as "believable design tools, which appear to be innocuous, but progressively engage designers in crossing boundaries of what should be acceptable" [8, p.1647], suggesting that design workbooks subtly push respondents to radical futuring. We structured our design workbook to introduce design concepts and opportunities for ideation and brainstorming, while still allowing free and flexible space for individuals to express their ideas and design fictions in whatever visual approach they felt comfortable with (see Figure 1). Our goal was to inform students on what speculative design is, use speculative methods to generate ideas on dystopian and utopian futures, and then conceptualize speculative technologies situated in those futures.

4.2.2   Black Mirror Episodes as Probes. As a way to facilitate design discussions we also used short clips of *Black Mirror* episodes to contextualize technology's role in utopian and dystopian futures. We showed three different *Black Mirror* episode clips as a way to probe thoughts about how technology might show up in the future and the potential societal implications of such systems. We followed the precedence of existing studies that have examined *Black Mirror* episodes in the context of socio-technological realities [12, 39, 68].

4.3   Data Collection and Analysis

Students took pictures of design workbook pages and uploaded them to a Google Drive folder co-owned by the first author and DAP instructors. Design sessions were audio and video recorded and professionally transcribed. Therefore, our data consisted of videos, photographs, pages collected from students' design book, researcher observations and reflections, and several iterations of a virtual white board controlled by researchers.

We took an inductive and iterative approach to the analysis. After each design session, the research team debriefed to unpack the experience. We discussed what happened, interesting observations, challenges and important points made by the students. Notes taken during design sessions were analytically memoed by the research team and reviewed against research questions. We employed content analysis to draw and analyze themes from the transcriptions. Storyboards, design scenarios, and design fictions were all analyzed through thematic analysis to identify themes [3]. We analyzed questionnaire results for descriptive data about our sample to understand a baseline of education, technology skills, and self-efficacy.

We successfully recruited a total of six young adults, the majority of whom were young Black or African American women (N=5). We used work such as that from Ambe et al. [3] as precedence for gathering rich qualitative data from a smaller sample size. Our demographic and technology use questionnaire also revealed that the average age of our participants was 17.6 years (Stdev=1.34 years), three were still attending high school, two had graduated high school and one had attended some college. Five of the six young adults were employed full-time. For this reason, one of the young adults chose to drop out after design session 3. Thus, five began the design sessions in late June. In terms of technology usage, all had a relatively high level of digital proficiency and used the Internet multiple times a day. Three participants regularly used the Internet with a traditional laptop or Smartphone. Only two of the five reported not owning a traditional laptop. The young adult who dropped out after design session 3 felt some discomfort with the online virtual environment and preferred to work at their primary job. We present that participant's data as part of this analysis and provide pseudonyms for all participants to protect identity.

5   FINDINGS

We present the results of our design sessions and themes that emerged from our analysis. We highlight the themes that emerged from participants' imagined utopias, design concepts that speak to utopian futures, and the design fictions that articulate these concepts. Last, we report participants' engagement with the design methods in a remote environment.

5.1   Emergent Themes of Utopian and Dystopian Futures

Three themes emerged from our analysis of utopian and dystopian futures: addressing social conditions in Chicago, returning to normal social behaviors, and speculative technologies as metaphors of existing oppression.

5.1.1   Addressing Social Conditions in Chicago. One of the major themes that emerged from our data analysis was the need to address social conditions in Chicago. In our first session students watched clips of *Black Mirror*, which highlighted dystopian realities exacerbated by technology. We asked students to identify elements of society that would contribute to dystopian futures if they remained unchanged. Students acknowledged that the primary dystopian challenges that they faced were racism, police brutality, segregation, poverty, and unfair housing policies. Figure 2 shows images
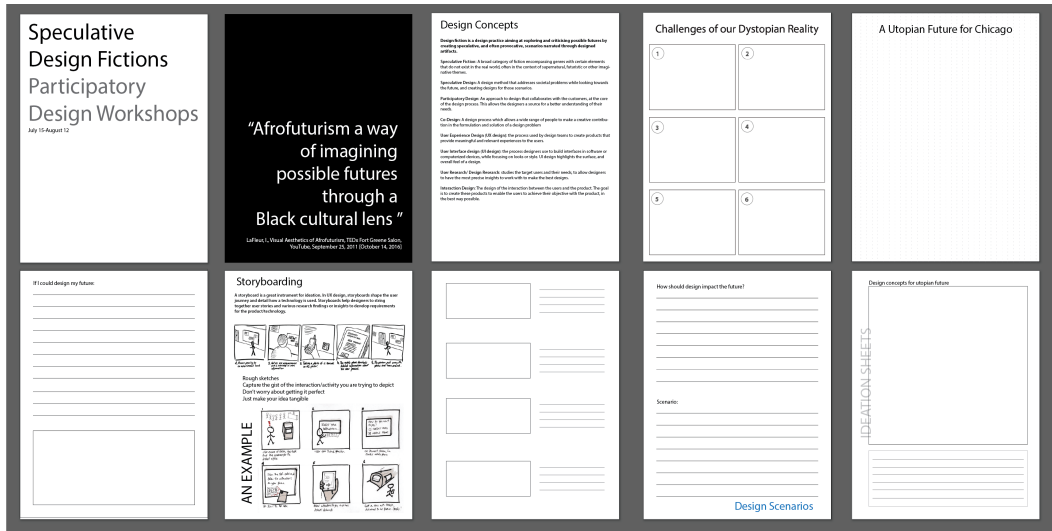
Figure 1: Select pages of the design workbook show prompts that guided students through design activities.

from student's design workbooks where they discuss these challenges.

In discussing what utopian futures would look like both for individual students and for the larger city of Chicago, students talked about the erasure of these same constructs (poverty, racism, unfair housing policies). *"It's like an unspoken and unbothered segregation in our city. Homes are cheaper when moving South or West. There needs to be an affordable balance that comes with homes"* - Erica. Brandon echoed this sentiment and added: *"There would be no more police brutality because there would be no need for police. There would be no gun violence anywhere."* Brandon also mentioned that in his envisioned utopia, poverty would be alleviated by giving *"equal opportunities to everyone."*

Acknowledging how the racial segregation of the city impacts engagement and perceived acceptance between white neighborhoods and Black and brown neighborhoods, students spoke about unity, peace, and racial harmony among neighborhoods also being important components of a utopian future for Chicago. This became a major part of our discussion during the third design session (i.e., envisioning utopian and dystopian futures). Students discussed that unity in the future meant acceptance across religion, race, ability, sexual orientation, and shape or size as shown in Figure 2, and that this unity was a major component of any utopia for the city of Chicago.

5.1.2 Impact of Ongoing Global Pandemics on South Side Neighborhoods. The next theme that emerged from our analysis was the impact that the ongoing global and local crises were having on the city and how many associated challenges spoke to bleak dystopian futures. Students commented on how dealing with COVID-19 and the political uprisings were impacting life for city residents, noting the dystopian challenges that might impact the future. These challenges included having to interact through masks, not being able to go out and socialize, and the "ghost town" nature of their city. During this discussion students also considered how local resources
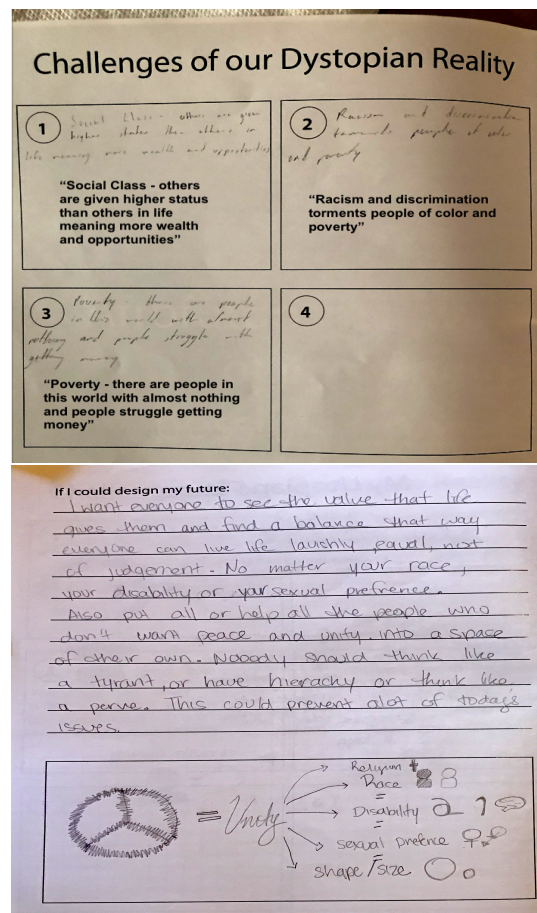

Figure 2: Pages from student workbooks identifying Dystopian challenges and Utopian ideas.

were impacted, identifying that many of these key challenges could lead to a potential dystopian future where *"money has now run out and that's an issue"* and *"brawls and riots have broken out everywhere and resources are running low so people live everyday fighting for their lives"*- Kendall. Similarly, Erica commented that in such a dystopian future, people are living less *"open and free"* because of restrictions set by health guidelines and overpolicing (see Figure 3). Students thought that current issues related to these pandemics would have a greater impact on South Side neighborhoods compared to other areas of the city and that this could result in bleak futures 5, 10, and even 50 years in the future.
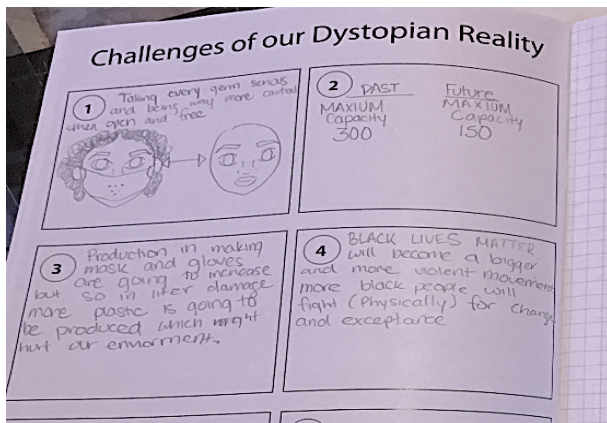

Figure 3: Identified challenges of a dystopian reality.

5.1.3 Speculative Technologies as Metaphors of Existing Oppression. The last theme that was prominent across our analysis was the feeling that many speculative technologies are a metaphor of existing oppression that marginalized populations experience. In response to reviewing and discussing clips from *Black Mirror*, students immediately acknowledged that the concepts shown were visual metaphors for how some marginalized populations are already treated. After the episode "Nosedive" (which depicts a social rating system where people rate their peers and neighbors 1–5, based on their social interactions), students discussed how this dystopian concept was not far off from current societal norms. *"[It's] similar to how people who were imprisoned, and are now free, and are trying to move on in life because of their record... they can't. And it causes people to judge. They can never get ahead"* - Erica. Students agreed that this was one of technology's negative implications and this would lead to more judgmental people in the future. They also compared it to the ways people are "addicted to judging each other" on social media.

Similarly, after viewing the clip of "The History of You" (which depicts a visual memory implant that allows people to replay all of their memories) students discussed privacy, incrimination, and how such a system would disproportionately impact their community. *"It could be a downfall. I mean it could be useful but probably more incriminating and used against you. They would find ways to use that against us"* - Kendall. When asked who the "they" was that Kendall was referring to, other students commented that this might be law enforcement, teachers, or other authority figures.

This conversation led to students thinking about the values or principles for future design concepts to support a utopian future in Chicago. *"Understanding"*, *"acceptance"*, and *"fairness"* were among the more commonly listed principles that future design concepts would need to embody, which we discuss in the next section.

5.2 Design Concepts and Fictions of a Post-COVID Chicago

During the 4th and 5th design sessions, ideation and collaborative design fictions, students ideated their concepts of technologies that would support their utopian futures. For these sessions students were directed to employ pages from their design workbook that allowed them to "write a story" about a fictional utopia that revolved around a technology that played an integral part of that future. Student ideas included: magnetic rings that solved societal issues by having a person simply put them together and state their intent, passageways that removed harmful cells from the body, and eyewear that served as a virtual reality portal for socialization.

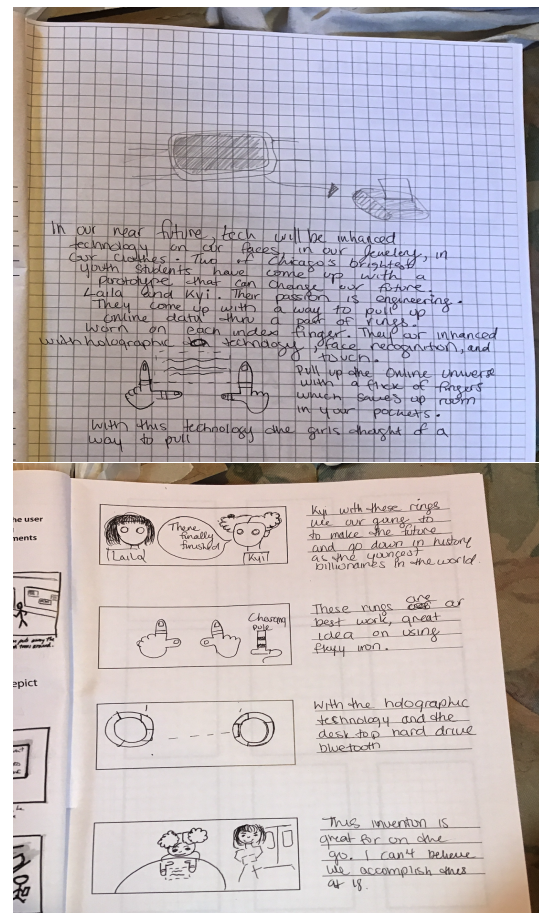

Figure 4: Written design fictions and storyboards of Erica and Ashley's speculative technology concept.

Erica and Ashley's concept involved the use of magnetic rings that could solve a variety of societal and environmental issues that

plague the world in the year 2050. By simply placing on the rings, one could do things like clean the ocean or feed people who are experiencing homelessness as shown in Figure 4. Erica and Ashley's collaborative fiction paid close attention to the materials that would be present in the rings, stating that they would have the impact of "*changing the world forever.*"

Ayanna's speculative technology concept addressed some of what students acknowledged as dystopian challenges that would appear as a result of the ongoing health pandemic (see Figure 5). She wrote the following as a part of her design fiction to describe her speculative technology concept:

> "The year was 2035, and life has forever changed thanks to Dr. Riley's invention. In a small remote town named Tocca Falls, there was a disease outbreak where a virus was going around. This virus was lethal, you could contract this virus by simply being outside. A little like COVID-19 but way worse. If you contracted this disease your insides would melt and you would feel like you were on fire, and most of the time you would bleed from your eyes. Dr. Riley created an invention that would attract the harmful particles and extract them from your body called the "Walk of Life". Her invention looked like areas of the sidewalk with strong magnets that remove disease particles from your body such as the ones in COVID-19. Every day at 12pm people would walk over the Walk of Life and be cured. But other towns outside of Tocca Falls did not believe in her invention. They laughed at her and refused to implement the Walk of Life in their own towns. So Tocca Falls was the only town cured and it became a Utopia."

Brandon described a concept for virtual reality eye-wear that covers the eye and would allow a person to remember the physical advertisements or buildings that they saw while walking home. Brandon speculated this as a response to social distancing and no longer being able to interact with people in person in the future. Once home, the user of the eye-wear could bring up those images from their memory and engage with products from the advertisements or even virtually eat dinner with a friend at a restaurant that they passed by earlier. In his design fiction, Brandon told a story of a fictional character, *"Ernest,"* who was living in Chicago 20 years in the future. Ernest used this eye-wear to attend meetings and eat dinner with friends because COVID had led to permanent social distancing. One day he and a friend noticed that while wearing the eye-wear, the world began to change based on their words. Buildings were revitalized and people were cured of COVID-19. Brandon's story ended with Ernest and his friend being able to go outside and no longer needing the eye-wear now that the world had changed back.

As a part of our ideation sessions, students discussed what was important to consider when developing new technologies to support utopian visions. Students responded with things like "who has access?", "what does it cost?", and "who can use it?"? *Will it do more harm than it will good is important... it's important to think about. Sometimes these are things we don't need and then people*
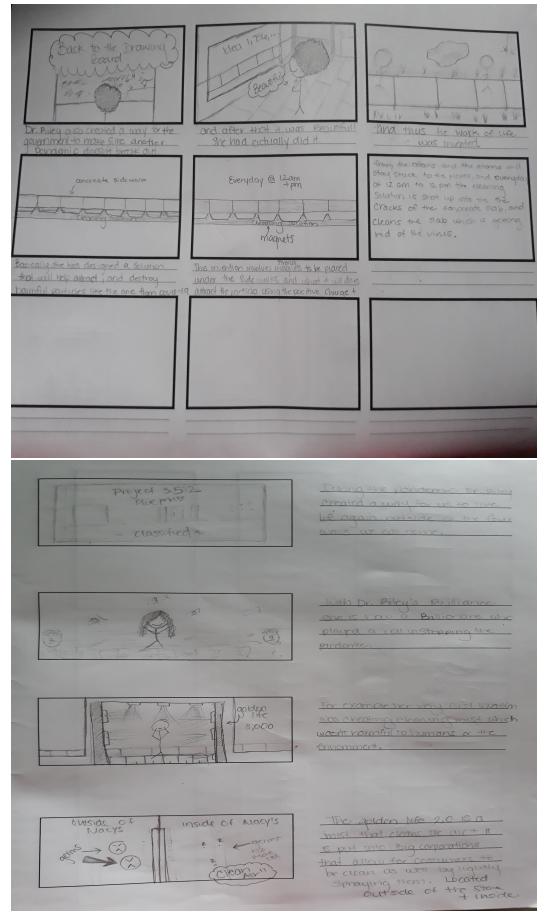

Figure 5: Storyboards and ideation of Ayanna's design fiction.

get addicted. Like social media and Instagram and TikTok and stuff. Technology could be good, but sometimes it can [cause] harm." - Erica.

5.3 Engagement in Remote Co-Design

Overall, participants were very positive about the structure of our design sessions. During the "I Like, I Learned, I Wish" exercise, one common comment among participants was how much they learned about design both in terms of concepts and about the practice of collaborative ideation. Participants identified that learning about the idea of futuring was specifically useful and what that meant for the ways they thought about their role in conceptualizing their future. *"I liked the videos that you showed because it gave me a broader perspective of possible future outlooks than any other time I was asked to think about what I wanted to see in my future"* - Erica. Similarly, many students thought that learning about the concept of Afrofuturism specifically resonated with them as a way to consider Black futures, something that had not previously been introduced in other settings. Ashley made the connection between Afrofuturism and the movie *Black Panther* and said that both *"gave Black people a sense of pride."* Ayanna added to this stating: *"I learned that Afrofuturism basically uses [the] speculative design method but*

is used to help benefit people of color. It allows me to see myself in it, in [the] design of futures."

Although not specifically solicited, another theme that was salient across our observations of the design sessions was the positive reception of and engagement with the physical design workbook. DAP students felt that having the design workbook and time to adequately think through their ideas was helpful and made for a good experience. *"I like the amount of time we were given to get down our ideas on paper to then share them out. The questions in the design book helped me to think through things and respond rather than just thinking of them on my own"* - Ayanna. These design workbooks also allowed students to document their ideas outside the scheduled design sessions and share ideas with research staff at their convenience after uploading them to Google Drive. *"I like the idea of the design book just so that I can jot down what's in my head and [it's] easier for y'all to see what I might be getting at. I might be slow sometimes because I'll want to hear someone else but I'm also taking care of my siblings while doing this"* - Brandon. Researchers also observed more ease in getting students to respond and discuss ideas when using options such as the Zoom chat function and the Miro board for brainstorming, although students elected to have researchers control the board during sessions.

Adversely, we also found that there were aspects of the remote co-design environment that did not work as well. One of the primary points of feedback in this regard was a general dislike for engaging in design activities via Zoom. Throughout the initial sessions there was a reluctance among students to engage in discussions and brainstorming with their *cameras on* because extended periods of Zoom interaction were something students commented they were still adjusting to. This is not to assert that having *cameras off* meant a lack of engagement. Students did report, however, their difficulties engaging in a remote design environment. In response to the *"I wish"* prompt, some students responded that they wished they were able to engage in person: *"what I wished was different is that we was in person—I don't like this online stuff"* - Ashley. As a result, participation fluctuated from week to week, with two sessions having to be rescheduled because students didn't show up. In some cases students opted out of our sessions to work at their primary job despite technically being employed by the Design Apprenticeship Program and compensated for these design sessions. DAP instructors commented that students might not feel comfortable with the conversational style of our design sessions, adding that many students that enroll in this program are visual and hands-on learners and "not big talkers" so talking into a screen might be jarring. Lastly, DAP students were not receptive to their ideas being shared beyond the design sessions. During our attempts to brainstorm a share out campaign, many commented on not wanting to share out ideas that were "rough" or "personal". In order to respect these feelings, the idea of a share out was abandoned by researchers for these design sessions.

6 DISCUSSION

Our case study serves as an exploratory investigation to understand how to engage marginalized young adults in speculative co-design to generate ideas for utopian futures. Through a series of design sessions guided by a design workbook that elicited technology values, design concepts, storyboards, scenarios, and technology-based design fictions, we provide valuable insights into both the notion of futuring among Chicago youths and remote co-design engagement.

In addressing our research questions, we found that co-design and concepts of speculative design, supported the idea-generation of utopian and dystopian futures among Chicago youths by providing space for collaborative discussion and brainstorming. Confirming prior work, we found that introducing the design workbook as a speculative fiction probe allowed students to engage on convenient terms [8, 32, 96], and provided a learning environment that was familiar to the DAP students. Feedback from sessions suggested that the design workbooks in paper form supported remote speculative co-design by giving students time to think through ideas and concepts. This confirms more recent findings of the importance of paper-based scaffolds to support initial brainstorming before uploading content digitally [42]. Our remaining research questions sought to identify and understand (1) what the imagined utopian and dystopian futures among Chicago youth are and technology's role, (2) whether the use of design fictions as a method of futuring to elicit new ideas could be successful, and (3) how speculative co-design is impacted by remote engagement. We address these questions by discussing students' *ideas of speculative futures in a city divided* and by *critically reflecting on why futuring at the margins* is important to the next phase of speculative design. Our discussion informs a set of methodological implications that inform future remote speculative co-design research.

6.1 Ideas of Speculative Futures in a City Divided

Our results uncovered key constructs that are difficult or perhaps impossible to separate from design. Common among our findings was that students have a difficult time imagining a future without the existing social issues they face today. Among many of the utopian concepts were still elements of identified dystopian challenges that seemingly could not be detached from concept generation. In all cases, students' technology-based futures encapsulated some form of racism and it was difficult for them to imagine technology that exists in a world without it. Previous literature suggests that human imagination is bounded and people might have difficulties imagining the future as situations become more distant in likelihood, perspective, time, and place [48, 70]. However, our analysis provides insight into the unique difficulty of envisioning the future that is confounded by race and social class, which was present among our participants.

As Black and brown digital natives, these young adults grew up in a digital age *with technology* providing endless opportunities for connection, communication, and problem-solving but have yet to experience a world *without racism*. As we suggested, the results of our work raise the question: *How can one imagine a technology that exists without racism if one has never experienced a world without it*? Envisioning such a future requires disruption and identification of components within an existing system that normalizes oppression. We turned to existing literature on cultural hegemony and its implications on the world of computing and the idea of futuring.

Students' concepts of a Chicago utopia included the absence of oppression faced by historically disenfranchised people. In many instances, these concepts sought to obtain basic human rights and access to resources that Black and Hispanic groups have been and continue to be excluded from in many cases. Students talked about a future world where such things as state or gun violence don't exist, a world with equal access to homes, and where people are accepted regardless of their skin color, sexual orientation, or other marginalized dimensions of identity. The utopian futures for Black and brown youth are the existing realities among other groups. Thus, we must consider the following question: *What does it mean for the limit of basic resources and conditions to shape the reality of certain groups so much so that futuring is limited to basic survival*?

Antonio Gramsci referred to cultural hegemony as the positioning of majority groups in places of control over funding and political support of cultural projects that thereby suggest them as having control over the cultural landscape of said projects [5, 35]. Within design, cultural hegemony speaks to technologies and spaces being created by groups that privilege certain identities, thus marginalizing others through technology itself [29]. This notion also permeates through who controls school curriculum and how well systemic oppression is recognized. Educators assert that students are limited in their ability to imagine innovative concepts when they are not taught about our country's history. *"They can't unmake it or remake it if they don't see that it's made."* [60, p.5]. While students in our study were very knowledgeable of systemic oppression and even how it appears in technology, radical futuring among this group still incorporated alternative worlds where oppression exists and has to be eliminated. Scholars assert that cultural hegemony limits our ability to be radical in speculating futures [57]. Thus, cultural hegemony could explain why our students' utopian ideals rested on access to basic resources and elimination of sickness. The surrounding environment of much of the South Side corridor is limited to such resources. There is overlap in the control of who has historically had access to futuring and who has had access to resources [57]. As such, futuring for some marginalized groups might be limited to what is known and seen more regularly [90]. Designers and practitioners must ensure inclusive and democratic design experiences, and the intersection of co-design and speculative design could help to ground and reveal these values [63].

6.2 Implications for the Future of Remote Speculative Co-Design at the Margins

Second, our results led us to consider design more broadly. Most design inquiries require us to engage people outside the context of our design ethos from an academic or practitioner perspective. However, how well are we taking into consideration that our realities aren't everyone's realities? How much thought have we as academics and practitioners put into the fact that racial climate is critical or detrimental to the consideration of speculative futures?

From our design sessions we saw that among young adults, a normalization of oppression shows up in conceptualizing utopias and technology that supports those utopias. There is a need for different techniques of speculation and futuring and for inclusion of more diverse voices. When designers of such technologies lack diversity and conduct research with overwhelmingly white, educated, and rich populations [40], systemic conditions fail to surface and issues such as discrimination, profiling, and exploitation ensue and are amplified [85]. Engaging historically excluded populations in our design and research by considering the ways they envision ideal futures and the role that technology plays in those futures is vital to computing and remains at the cutting edge of supporting communities across all abilities, races, genders, classes, and educational backgrounds.

Our participants expressed concerns about the impact of speculative technologies on marginalized groups. Participants commented that despite the positives of future technologies, potential harm to Black or brown communities has not been considered in the conceptualization or development of new technologies. Considering such impacts may be supported by including those affected by these systems in design futuring. Understanding experiences with harmful and exclusionary technologies as well as perspectives that might mitigate such design results could serve well across HCI research spaces. Our findings provide insight into methodological considerations for the future of remote co-design among communities that are not typically present in design research such as marginalized youth.

6.2.1 Engaging Marginalized Perspectives of Speculative Design. Findings from our case study suggest that there is merit in introducing Afrofuturism as a lens for speculating future technologies. Students were able to quickly engage with the concept of speculative design by connecting Afrofuturism as a design perspective that resonates with their identity and lived experience. We assert that introducing this lens of speculative design during our design sessions was meaningful not only to the ways Black youth perceived technology, but also as exemplification of providing *"greater reflection, intentionality, and voice to considerations of inclusion within the design process"* [94, p.45].

Afrofuturism presents speculative design that shares features of critical design through an interplay of science fiction and magic realism [25]. It imagines futures from an oppressed position and within the realm of HCI it suggests that we consider sociocultural dimensions in the conceptualization of future technology. Youth from our co-design sessions often described dystopian futures that considered this interplay of oppression and magical realism, similar to those detailed by novelists in the Afrofuturism genre. The dystopian future described by Kendall might be likened to Octavia Butler's *Parable of the Sower* [19], indicating the relevance of an Afrofuturism lens when considering such futures. When considering structures that must be transformed or deconstructed, scholars suggest that Afrofuturism is both *"reflection and action"* and *"an aesthetic that offers powerful meaning for Black youth"* [25] who otherwise might not engage in design. We add that this lens might be a critical praxis in the speculative futuring of technology, to center Black and brown realities while considering history and culture. As evidenced by this case study, Afrofuturism thus becomes a plausible methodological approach for future speculative design efforts as a way to imagine design that is both empathetic and meaningful.

6.2.2 The Value in Diverse Design Fiction Probes. There were clear benefits to having various design fiction probes as a part of this

study. We got rich data about speculative technologies from watching short clips of *Black Mirror* with students and discussing them. It helped students to identify that social and political implications of technology are not always considered when systems are designed by the majority. As a probe and way of contextualizing our design sessions, these clips helped students to think in the realm of future technologies that do not currently exist. The sharing and discussing of such clips might support remote speculative co-design by helping researchers frame what speculative design is and how design fictions inform such speculative technologies. One recommendation to maintain engagement might be to spread these video clips across sessions and then have attendees create fictions in response to these videos.

As other scholars have noted, our design workbook served as a qualitative research tool that supported design participation such that design researchers and *non-designers* are able to communicate in ways that don't feel intimidating or pressuring [8, 32, 62, 96]. The DAP students were able to iteratively visualize their ideas and choose what they shared with the larger group at their own comfort level. Students responded well to the activities of ideation, storyboarding, and creating design fictions. Speculative design activities such as storyboarding and design fictions seemed to spark imagination among students and allowed them to identify situations and social settings for their ideas of speculative technologies and to evaluate these concepts when no interactive system yet exists [74, 79]. Creating design fictions to fully speculate time frame and location of their ideas for speculative technologies also allowed students to consider and provide social context to their ideas, which might help HCI researchers consider innovative ways to elicit futures to address sociopolitical challenges [7, 49].

Design workbooks also provided space and flexibility for students to navigate work schedules and supported some students having to care for families, endorsing the call for more inclusive co-design methods [90]. Students were able to consider prompts and document ideas at their convenience, suggesting a type of flexibility that researchers have spoken to as a promise of remote co-design [54, 55]. We posit that mailing tangible probes such as a paper design workbook provides a more inclusive approach to this flexibility, providing consistent points of interaction for those who might not be able to engage with online discussion boards daily. As such, this should be considered a valuable component of remote speculative co-design.

6.2.3 Importance of Flexible Scheduling.
The format of sessions was also important to how students' perceived our design engagement. We found that providing students with breaks where they could turn off their cameras while thinking and ideating was helpful. Although we did not experience issues with bandwidth or connectivity, three of our students participated via Zoom using their phones. Providing these breaks and spreading sessions out weekly helped to eliminate potential videoconferencing fatigue, which students began to mention around session 3.

In future iterations of this area of research, sessions should be more hybrid with shorter instances of online engagement and time between sessions where individuals can work offline to flesh out ideas. Lage et al. suggested that such an approach, or the concept of an inverted classroom, makes for an inclusive learning environment

for students where events that traditionally take place inside the classroom now take place outside the classroom and vice versa [11, 46].

7 CONCLUSION AND FUTURE WORK

We conducted a case study consisting of a series of remote co-design sessions with Chicago-based youths. Our goal was to examine co-design and futuring through speculative design fictions and storyboarding as methods to envision utopian and dystopian futures. The necessity of this work should be thought of similarly to that of feminist or intersectional HCI, as a way to address the margins of design. As stated by Latinx feminist and anti-racist organizer Francisca Porchas Coronado (Director of Latinx Therapists Action Network) at the CTZN Summit 2020: *"Look for those who are the most impacted by this moment, and they'll know what to do. If you show up and follow their leadership, you will most likely feel nourished, and know what to do next."*

Our results show that speculative design and design fictions can help to elicit radical visions and social, political, and cultural dimensions that are valuable to equitable design and innovation. Based on our findings, we suggest future investigations of speculative co-design to support inclusion of marginalized populations in futuring and to understand what the disruption of cultural hegemony among marginalized populations might entail when futuring. We must begin a deeper examination of our approach in terms of how we frame our design engagements and conduct design research, and who is included in these engagements, and re-assess our commitments to inclusive design practices.

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