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Thinking and Designing at the Intersection of Technology and Civics: A Case Study of an
International Civics Coding Camp for Girls

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Abstract

In today's climate of rising economic inequality, drone warfare, xenophobic politics, and Big Brother technology, understanding how we might best design learning environments to provide opportunities for expanding the purpose and potentialities of STEM education for minoritized communities grows in importance daily. This dissertation is a 3-part study that examines the impact of a 6-day civics coding camp implemented in Chicago, Illinois, and Kingston, Jamaica. The program was designed to empower high school girls to see themselves as purposeful, powerful agents of change in their communities. The curriculum presented coding, design-thinking, and leadership as inter-connected, inter-dependent resources for civic engagement. The first study describes the ways in which a STEM-focused non-profit organization negotiated and grappled with equity from its inception to three years after its pilot program. The second study is a quantitative analysis of changes in coding, leadership, and design-thinking self-efficacies over the course of the intervention. The third study examines students' understanding of inequality. Together these studies offer Learning Scientists and practitioners interested in developing interdisciplinary STEM programs design principles to further equity-oriented work.

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Introduction

In today's climate of rising economic inequality, drone warfare, xenophobic politics, and Big Brother technology, knowing how to support students' pursuit of community empowerment through technology grows in importance daily. Learning at the intersection of civics and technology requires an understanding of the sociopolitics governing your life or community and thinking about the ways in which technology can be used to redress systemic inequities that you and your community experience. Youth learning at this intersection will also need a strong belief in themselves and their ability to make a change in the world because it is that belief that propels them to act on their knowledge.

In this dissertation I look at three key concepts important to learning at the intersection of technology and civics - equity, self-efficacy, and inequality. My place of study is a civics coding camp implemented in Chicago, IL and Kingston, Jamaica. The first study asks, "how does a STEM- focused non-profit organization rationalize equity?" I use archival analysis of organizational files to see how founders grappled with equity in the organization's early stages, when co-founders had divergent political views, and when the organization engaged external funders. The second is a quantitative analysis of change in three types of self-efficacy – coding self-efficacy, leadership self-efficacy, and design-thinking self-efficacy – using pre- and post-surveys. The third study presents a typology of students' understanding of inequality. I analyzed open-ended questions on a survey administered to participants before and after the civics coding camp. Together these studies offer learning scientists and practitioners interested in designing interdisciplinary STEM programs guiding principles to further equity-oriented work.

Intervention

BGBinc[1] is a non-profit that offers civics coding bootcamps to high school girls. Over the course of six days, students are engaged in coding, design-thinking, and leadership activities. More specifically, students learn HTML, CSS, and Javascript, how to prototype, how to work in a team to think through complex social issues (like access to education and healthcare), and how to effectively communicate their ideas to an audience. They are also engaged in self-efficacy exercises that encourage them to think about their purpose in life and their visions for their futures. Over the summer of 2017 – four camps took place. Three in Chicago IL, and one and Kingston, Jamaica. Volunteers, particularly women with similar racial/ethnic backgrounds to youth attending the camp were recruited as mentors. BGBinc targeted students from under-resourced neighborhoods primarily through two mechanisms. They partnered with high schools in those communities and signaled to teachers that they were offering coding camps for free to students who might not be able to afford similar opportunities.

The camps lasted 45 hours. Approximately 15 on coding, ten on design-thinking, ten on leadership and the remaining ten hours were for games and lunch. The intervention was designed to intentionally leverage the diverse forms of expertise participants brought to the camp so that they felt and believed in the social consequence of their work. The curriculum followed a design-thinking process created specifically for this camp. On their first day, students learned about Purpose and Design-thinking. To help them articulate their purpose in life, students were asked to reflect on their life in an exercise called Path of Life. During this exercise, students created a pictorial representation of their entire life up until that day at camp. Students talked about their

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[1] Anonymized to preserve confidentiality

experiences with homelessness, parents' mental illnesses, and their struggles making friends in new communities. Students also talked about their passion for music or anime, and their trips overseas. This activity set the tone for the camp. Coaches helped students see how their stories were connected and used that as a launching pad to connect personal stories with community issues they had experienced.

After students had picked an area of interest to explore and formed groups, they started the design-thinking process to break the topic area into a tractable sub-problem. They used a tree-like structure to make sense of and propose causal theories for a social problem they experienced. The tree's leaves represented personal experiences, the roots represented the causes of the issue, and the branches and trunk connected the two levels. This tree represented a simplified theory of causality for a community issue. Students conducted interviews with community members or topic experts to gain a deeper understanding of the problem. They then used those interviews to help them refine their articulation of the problem they wanted to address.

The next stage in the design process asked students to create solutions. Students drew paper prototypes of their technological solutions and used these prototypes to build their website using CSS, HTML, and JavaScript. The camp included activities to allow youth the chance to develop mastery early on in the camp. For example, students were given relatively simple coding activities that they could complete and feel like they mastered on the first day, and then were encouraged to do more challenging tasks as the camp proceeded. STEM professionals and civic leaders were invited to camp to share their stories with the students. While each day had a focus, each module was featured in some portion of the day. In other words, each day was a mix of design-thinking, coding, and leadership.

Significance

Research on youth civic engagement is prolific. We know that youth should be recognized as legitimate sources of knowledge and power (Beaumont, 2010; Fox et al., 2010), that they need adult allies (Fox et al., 2010; Finlay et al., 2010; McIntosh & Youniss, 2010), and that they need to feel like they a part of a supportive and efficacious community (Fox et al., 2010). There is also a lot of research on how to support STEM education in informal and formal learning spaces (Bang & Medin, 2010; Barron, 2004). We know about the disparities amongst girls and minoritized youth in STEM (Ireland et al., 2018). We know that to support non-dominant groups in STEM, curricula and pedagogy should be culturally relevant (Roseberry, Ogonowski, DiSchino, & Warren, 2010) and diverse approaches to meaning-making should be supported (Bang & Medin, 2010). However, there is notably less research on *civics* in STEM informal learning spaces (exceptions include Vakil, 2018; Vossoughi et al., 2016; Vossoughi & Vakil, 2018). Civics in STEM is important, particularly in this political moment (with fascism on the rise, gross income inequalities, and a deeply polarized politic) because the technological landscape is changing rapidly. Digital technologies offer unprecedented opportunity for youth to connect to and communicate with large audiences. Engaging these future leaders now in anti-discriminatory design – a type of design that redresses inequities - is important. As educators, we need to help youth go further than data literacy and computational literacy. We need to help them to also develop critical literacy so that they can understand and critique technologies' use in society and invent new or reimagine relationships between those technologies and society. This is especially important for minoritized communities and citizens of formerly colonized nations that are often beholden to technologies that put them at risk.

Summary of Studies

In the first study, I combine Learning Sciences and Organizational Theory to understand how BGBinc grappled with multiple equity frames. I analyzed organizational files, executive meeting notes, grants, and audio recorded meetings during BGBinc's first 3 years in existence. Archival analysis took place over three stages. First, I created a timeline of the organization's major developments and then developed a list of "disturbances" (Karkkainen, 1991) or significant tensions revealed in the data. Then, I created a list of equity codes derived from the literature on equity in STEM education. Finally, I created narratives that combined multiple data sources to examine the unfolding of each "disturbance". I argue that co-founders wrestled with multiple equity frames to remain relevant and solvent. At times, this negotiation reflected founders' competing values and perspectives of how equity should be expressed and operationalized. I showed how the organization wrestled with multiple social-justice equity frames while seeking funding by highlighting the silence on the more radical frames.

The second study is a quantitative analysis of pre- and post-surveys to determine whether and to what extent the intervention positively affected students' perceptions about themselves as agents of change (leadership self-efficacy), designers (design-thinking self-efficacy), and coders (coding self-efficacy). Composite scales from 32 survey items were created and analyzed. Coding self-efficacy was created from five survey items, the design-thinking self-efficacy scale from 12, and the leadership self-efficacy scale from 15. I used factor analysis to determine whether the constructs were valid. Cronbach alphas, a test of internal-consistency reliability, item-total and inter-item correlations are reported for each scale. I analyzed regressions with control variables for key demographic covariates to determine the extent of change over time. I then ran regressions where the covariates were included as dummy variables to see differences

across racial groups, camps, and age groups. The three major findings are: 1) all three types of self-efficacies increased over time, 2) age, cultural context, and race did **not** have a statistically significant impact on change in self-efficacy, and 3) prior exposure to coding had a negative and statistically significant impact on coding self-efficacy.

The third study asks, "what theories do American/Jamaican youth articulate to explain inequality in the US/Jamaica?" To answer this question, I referred to literature on stratification beliefs. In Sociology, the stratification beliefs literature studies people's beliefs about inequality and poverty by examining population-representative public opinion polls. Public opinion on inequality is largely of two types - individualist or structural. Individualist beliefs attribute inequality to the poor's lack of talent or motivation and the wealthy's inherent skill or entrepreneurial spirit (Feagin, 1972). Structuralist beliefs reflect systems-level or societal reasons to explain inequality, for example unemployment or inequitable access to quality education (Hunt, 2007). I use the codification of stratification beliefs in the literature as a conceptual and analytical tool to examine the ways in which students theorized inequality. I completed two rounds of coding. The first cycle of coding was deductive. In the second cycle of coding, I employed inductive methods to codify the types of individualist and structuralist beliefs emerging through analysis.

I argue that students' theorizations of inequality are nuanced, complex, and differ qualitatively from adult public opinion. Unlike adults, youth in this sample who believed that peoples' actions cause inequality blame discriminatory and prejudicial action towards others as opposed to a person's lack of talent or will. While these youth highlight peoples actions or beliefs as causes or inequality, they also attend to the structural conditions that create an inequitable opportunity structure (Ireland, 2018). Jamaican and Black American youth expressed

similar patterns in their belief structure but Jamaican youth foregrounded classism while Black American youth focused on racism and present-day segregation.

Study 1

When Equity Means Everything and Nothing at All:

Framing Equity in a Coding Camp for Girls

Introduction

Computer science (CS) education comes at the heels of the fourth industrial revolution (Gwata, 2019). As multilateral agencies worry about the fate of the developing world's labor force under gross and rapid automation (Kim, 2018), CS education is touted as an economic salve (Vakil, 2018). American multinational companies fearing declining competitiveness and productivity pour millions of dollars into diversity recruiters to find stop gaps to the leaky STEM pipeline. In this way, diversity, while valuable on its own terms, is positioned as an investment in human capital in the service of innovation, competitiveness, and profit. Noting the glaring gender and race-based gaps in the STEM workforce, and the history of segregation in the United States, broadening participation in the STEM workforce is a worthy goal. However, educational equity work that strives for quantified forms of inclusion to achieve "diversity" may or may not disrupt deficit-based narratives and assimilationist prerogatives (Baber, 2015; Hartmann, 2015).

To meet the increased demand for STEM education, schools, afterschool programs, and non-profit organizations dedicated to educating the future work force create new robotics programs, coding bootcamps, and makerspaces. They target women, minoritized children, and youth groups that face systemic barriers to full participation. In some organizations, equity work focuses on access – minoritized youth receive quality STEM instruction and gain entry into well-compensated and high-profile career tracks. In other organizations, access is necessary but not

sufficient to advance equity. How non-profit organizations (NPOs) grapple with equity will depend on the values they espouse, their mission, and their funding structure (INCITE, 2007). In this paper, I focus on one non-profit organization that offers STEM summer programming to high school girls. I ask, how does a STEM-focused non-profit organization rationalize equity?

I look at a non-profit organization (NPO) co-founded in early 2015 by 3 women that offers civics coding camps to high school girls. The NPO, called BGBinc (anonymized to preserve confidentiality) teaches computer science, design-thinking, and leadership over the course of six days. BGBinc has two major goals – 1) to help learners identify with coding, and 2) to engage learners in the socio-political reimagining of technology, its uses, and relevance to their communities. In the course of this study, leaders within BGBinc contested, shifted, differentially foregrounded, re-articulated, and shaped these goals over time. I use archival analysis of organizational files to reveal the ways in which a new and developing STEM-focused NPO framed and rationalized equity. I place analytic focus on mission development as this is an important NPO management practice for new organizations (Drucker, 2012). To the Learning Sciences, I contribute a critical analysis of an organizational form (NPOs) that is quite common in informal learning environments. At the organizational level, there is a plethora of studies examining schools (notable examples include Spillane, Parise, & Sherer, 2011; Bridwell-Mitchell, 2018; Espeland & Sauder, 2004) but few on non-profits in education. Studies on informal learning environments often focus on pedagogy, technology, student learning, and interactional design (for e.g. Cole, 2009; Horn, 2013; Stevens, Satwicz, & McCarthy; 2012). Few studies link learning sciences with organizational literature (Hand, Penuel & Gutierrez, 2013; Jurow, Teeters, Shea & Steenis; and Engle, 2006 are notable exceptions). In this paper, I combine organizational theory and learning sciences to understand how varied equity frames

were interactionally instantiated in organizational documents over three years of NPO operation. I argue that co-founders wrestled with multiple equity frames to remain relevant and solvent. At times, this negotiation reflected founders' competing values and perspectives on how equity should be expressed and operationalized, particularly when seeking funding from external parties. In the following sections I review the literature on equity in education and present framing as the theoretical framework. I then describe the setting and participants. Next, I report my findings using a systematic review of archival data to describe five frames and 15 rationales. In the discussion section I outline how these frames could affect program and curriculum development.

Equity

The word "equity" is multiply constituted, "ideologically saturated," weighted by history, dialogic, and deeply political (Bakhtin, 1981). Generally, equity theorizes an idealized and moral distribution of economic, social, and symbolic resources. Views about why equity, how to achieve equity, and for whom equity should be a priority are conceived through the clashing, converging, and transmutation of meanings, values, and ontology (Philip, Bang, & Jackson, 2018). The word equity has lived and lives "a real life, struggl[ing] and evolv[ing]" in the social languages of the world (Bakhtin, 1981, pp. 291-292). In the sections below I trace the ways in which the meaning of equity has shifted over time in the United States. My intention is to show the many ways people have approached equity work, some with deficit-based orientations and others with liberatory intentions.

Equity as fairness – a history.

In the United States, equity as an instrument of social justice has changed dramatically to reflect the changing political times. Before the American Civil War - a time in which African Americans were legally defined as 3/5 human - there were limited pathways toward equity. Educating Black students was outlawed and the pathway to full citizenship did not exist (Lee, 2009; Espinoza & Vossoughi, 2014). In the early 1900s, after the Civil War, opportunities for schooling were more readily available. By 1930, Black community members had established approximately 2000 independent and church schools in the South created expressly for their black children's economic and social education (Dubois & Dill, 1911 cited by Lee, 2009). By 1940, 78% of Black children in the Southern states aged 5-14 were attending school (compared with 79% of White children of the corresponding age group) (Anderson, 1988). Still, there was an urgent need to train more Black teachers to support the demand for black education and reduce teacher burden. Northern philanthropists saw this growing demand and the shortage of black teachers as an opportunity to shape black education ideology (Anderson, 1988). They provided funding for black schools that centered curriculum on "industrial and manual training." Classical liberal education was seen as "too academically-oriented" for people who would eventually become laborers (Anderson, 1988, p. 114,). One could infer that the opportunities White northern philanthropists advocated for at that time was founded on the assumption that Black communities would remain second class citizens whose limited intelligence relegated them to low-paying, low-skilled (typically manual) labor. Or, that the capitalist motivations behind industrial training were necessary for the rapidly growing economy post-Great Depression and pre-World War II. These potential rationales foreshadow later efforts to universalize access to education.

In the second half of the 20th century, the opportunities afforded by schooling would provide pathways for some black students, but only those who successfully adopted middle-class values and norms that signaled the right type of (social) language, dispositions, and attitudes (Guttierez & Jaramillo, 2006; Lee, 2009; O'Connor, 2001). In 1954, Brown v Board of Education struck down the "separate and equal" argument to desegregate schools. This decision restructured the politics in this domain around the provision of access to historically marginalized communities. In this new age of equal treatment for all, culture of poverty theorists like Moynihan (1965) offered compensatory education models - models to make up for the culturally deprived, maladjusted, fatherless, welfare-dependent or "socially patholog[ical]" students who could be successful if only they had the right training (Lewis, 1966; Rainwater, Yancey & Moynihan, 1967; Deutsch, 1963). This work presumed that low income minoritized students had innate risks or deficits that they had to overcome (Lee, 2009; Vossoughi, Hooper & Escude, 2016; Guttierez & Jaramillo, 2006). Thus, the concept of equal treatment for all was racially coded and true equality was constrained by eugenicist notions of intelligence.

These deficit-based orientations to educating minoritized communities are the historical precedents of equity work today. Concepts like fairness and equality re-emerge in color-blind policies that advance a sameness-as-fairness meritocratic rationale that focuses on individual ability, resilience, and grit. For example, CS4All, President Obama's policy to make computer science education universal in the K-12 curriculum, is a color-blind policy touting educational equity. The policy's official blog post states, "Tech careers are exciting, fun, high-impact, and collaborative as well as being critical for our economy. We want all Americans to have the opportunity to be a part of these teams. CS For All will help make that a reality and ensure that every student has access to Computer Science in their classrooms at all levels" (Smith, 2016).

Even more recently, the National Science Foundation's strategic plan for fiscal years 2018-2022 uses the term 'diversity' but does not explicitly discuss the communities (racial or otherwise) that they would target to "broaden participation." Indeed, NSF notes that "their core values are ExPLICIT in what they do every day" (p. 11) but they do not explicitly define Inclusion, their value that "strives to maintain staff that is representative of the broader national community," (NSF, 2018). Critical scholars critique this approach by arguing that while equality of inputs is necessary, it is not enough to restructure inequitable relations, practices, and policies that constitute the system (Gutierrez & Jaramillo, 2006; Philip & Azevedo, 2017). If youth are given equal opportunity - quality instruction in quality schools, quality family support living in quality neighborhoods - then all youth will rise to the top. If youth happen to come from a '*damaged*' family structure or impoverished community, as long as they persist and focus, they too can be successful. As Gutierrez and Jaramillo (2006) aptly explain, these color-blind approaches to educational equity "obscure the link between economic disparities, asymmetrical power relations, and historically racialized practices" (p. 181). In effect, instead of adopting a systems-level approach to educational reform, "equity as fairness" requires certain political attention on equal inputs, but places the full blame of inequitable processes, experiences, and outcomes on minoritized communities and individual behavior. Marxist scholars (Au, 2018) would argue that the dual pathways defined by the schooling system - success for the white middle-class population and failure for the colored lower-class population - are mutually constitutive. One cannot have success without failure and thus the failure of the schooling system is designed (McDermott, 1997).

Equity as diversity.

Diversity leads to objectivity.

In her review of the Broadening Inclusion Criteria at NSF, Intemann (2009) puts forward an important and somewhat overlooked rationale for diversity - increased diversity in science improves objectivity. Intemann argues that diverse scientific communities will lead to reduced bias as those with different life experiences are able to point out the biased assumptions the typical (read: white male) scientist might unconsciously make. As long as there are mechanisms that allow feedback to be heard and respected, diversity will strengthen objectivity. She is careful to note that people from different communities do not have "special way[s] of knowing" but rather, they are fact checkers or safeguards against leaky subjectivity (p. 263).

Diversity as "socially enlightened interest".

Philip & Azevedo (2017) offer an overview of equity in STEM, citing three general classifications popular in the STEM equity discourse. Equity as "socially enlightened self-interest" refers to the argument that we should offer STEM education to diverse and underrepresented groups to meet the demands of America's growing and increasingly tech-dependent economy (NRC 2012 cited in Philip & Azevedo, 2017, p. 1). Critical scholars note that this position furthers US imperialism, and military and economic dominance to the detriment of the global south (Vakil, 2018; Vossoughi & Vakil, 2018; Morales-Doyle, 2019). Further, this position does not necessitate transformation of asymmetric power-relations vis a vis dominant and non-dominant communities (Bang & Vossoughi, 2016). In many ways, it pushes forth an assimilationist prerogative - those who want to be successful need to participate in particular (read: normative white middle-class) ways to climb the socioeconomic ladder. (This is no different than the aforementioned equity arguments put forward by culture of poverty theorists

50 years ago.) A version of this rationale argues that recruiting non-dominant communities will improve the overall talent pool and promote innovation. The brightest (future) scientists, technologists, engineers, and mathematicians who come from minoritized communities could face obstacles that prevent their entry into the STEM field. These obstacles should be removed so that their talent can be utilized in the workforce for the advancement of national socioeconomic interests (Intemann, 2009). In other words, diversity is needed for innovation.

Diversity leads to social justice.

Generally speaking, social justice work makes a moral argument that marginalized groups should receive targeted, additional, and/or remedial support for their social, economic, or professional advancement. A review of the literature shows that this equity frame can take many forms, ranging from conservative or neo-liberal approaches to more progressive or critical approaches. For example, Vakil (2018) describes dominant- and justice-centered approaches to equity in computer science education. The dominant approach highlights the social implications of technology, focuses on cognitive processes, student choices, and promotes deficit-based ideologies. Justice-centered approaches highlight the political implications of technology, respects students' multiple identities, attends to the inequitable distribution of power, and engages culturally and politically relevant pedagogy. Equity-for-social-justice might advocate for affirmative action-type programs and policies that provide additional funding for minoritized students to gain access to STEM programs in prestigious universities. Racially/ethnically diverse scientists might also advance different types of research questions that re-focus or reposition marginalized communities. This could lead to scientific orientations, technologies, products, or services that improve the well-being of marginalized communities. Scientists from diverse

backgrounds might also soften the politically fraught relationship between research and the community. If participants see more people like them conducting research, minoritized participants might be more willing to give up their time, bodies, space, and thoughts to science. This type of politicized trust (Vakil, Mckinney de Royston, Nasir, & Kirshner, 2016) can be honored or exploited. Equity-for-social-justice could also include work that highlights the importance of repositioning STEM as a tool used by social justice movements (Jurow, Teeters, Shea & Van Steenis, 2016). This frame also considers the politics of technology and science, its present and historical relationship with communities of color, and the role that STEM programming plays in mediating the sociopolitics of STEM education (Vossoughi et al., 2016).

Educational equity in the Learning Sciences.

Socio-cultural learning scientists have defined educational equity as supporting and designing for heterogeneity in learning environments so that learners draw on multiple funds of knowledge consequential to everyday and academic learning. In this way, equity is about offering multiple pathways for students to leverage multiple repertoires of practice to identify with and develop a sense of belonging in academic disciplines (Nasir, Roseberry, Warren & Lee, 2014; Roseberry, Ogonowski, DiSchino, & Warren, 2010; Moll, Amanti, Neff, & Gonzalez, 1992; Lee, 2001; Cole, 2009; Gutierrez, 2008). Informal learning spaces are one such pathway (Barron, 2004). Equity-oriented research has offered us empirical data to validate the idea that out-of-school science helps learners reconceptualize what counts as science (Bang & Medin, 2010), build bridges across hobby-based activities, cultural traditions, diverse language practices, and academic content (Lee, 2001; Orellana, Martínez, Lee, Montano, 2012; Gutierrez, 2008; Nasir & Hand, 2008), and understand the socio-historical and political tensions that constitute

STEM in particular (Vossoughi et al., 2016; Vakil, 2018; Harding 1993; Benjamin, 2013). These lenses give us the analytic leverage to conceptualize equity as liberatory, as "loaded with possibility" (Uttamchandani, 2018, p. 2). They also offer a qualitatively different learning experience, one that upends deficit-based frameworks for desire, change, and potential (Tuck, 2009). In the section below, I use framing in the organizational literature as a conceptual and analytical tool to examine the ways in which NPO's rationalize equity.

Theoretical Framework

In this paper, I make sense of the multiple ways actors have mobilized "equity," in the educational domain by pulling on the interdisciplinary concept of framing. Framing finds its roots in multiple disciplines including social movement theory (Benford & Snow, 2000; Johnston & Noakes, 2005; McAdam, McCarthy, Zald, & Mayer, 1996), organizational sociology (Goffman, 1974, Weick, 1995; Scott, Ruef, Mendel, & Caronna, 2000) political sciences (Gamson, 1992; Chong & Druckman, 2007), media studies (Scheufele, 1999; Kitzinger, 2007) and the learning sciences (Jurow et al., 2016; Engle, 2006; Hand, Penuel, & Gutierrez, 2013). Frames are metacognitive meaning-making tools that foreground particular situations or activities and make rationales, interpretations, and orientations relevant to that activity. For example, a co-founder might frame the failure of a crowdfunding campaign to raise adequate funds as a lack of community buy-in as opposed to poor marketing. One frame could lead the co-founder to conclude that the community is not ready to receive the NPO's services while the other frame could prompt the co-founder to employ more precise targeting of campaign supporters.

Frames are dynamic. They are constantly contested, re-shaped, and re-constituted as actors negotiate meaning and significance. Actors draw on "cultural material" that provide the "extant stock of meanings, beliefs, ideologies, practices, values, myths, narratives and the like" (Benford & Snow, p. 629) to make sense of the frames. And in turn, these frames provide a lens, an organizing principle through which actors makes sense of reality. Frames are thus shaped by the cultural resource base, and in turn, shape culture. Frames can be powerful sociopolitical tools as they make visible certain aspects of reality that "promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation" (Intemann, 1993, p. 52). In this way, frames act as methods of orchestration or "an interactional roadmap" - guiding people's interpretations, interactions, and mobilization of resources. "It sets the scene, defines the characters, what counts as rational action, and even the means by which people might accomplish particular purposes" (Hand et al., 2013, p. 252).

Some types of frames allow for more flexibility and interpretive range. These frames may be called "master frames" defined by Benford & Snow as "a kind of master algorithm … that is broad in interpretive scope, inclusivity, flexibility, and cultural resonance" (p. 619). A master frame can belong to multiple social movements or organizations and as such has multiple derivatives and instantiations, for example rights frames, choice frames, and injustice frames. I posit that equity is one such master frame. In this study, the master frame is interpreted in light of the literature on the shifting meaning of equity. Equity, the master frame, can be interpreted in terms of fairness, objectivity, innovation, and social justice. These frames allow for varied interpretations or organizing principles I call rationales. The relationship amongst these constructs is shown in the diagram below.

Figure 1

Equity as a master frame

Equity (master frame)

| Equity-as-fairness | Equity-as-objectivity | Equity-for-Innovation | Equity-as-social-justice |

Rationale 1 | Rationale 2 | Rationale 3 | Rationale 4 | Rationale 5 | Rationale 6 | Rationale 7
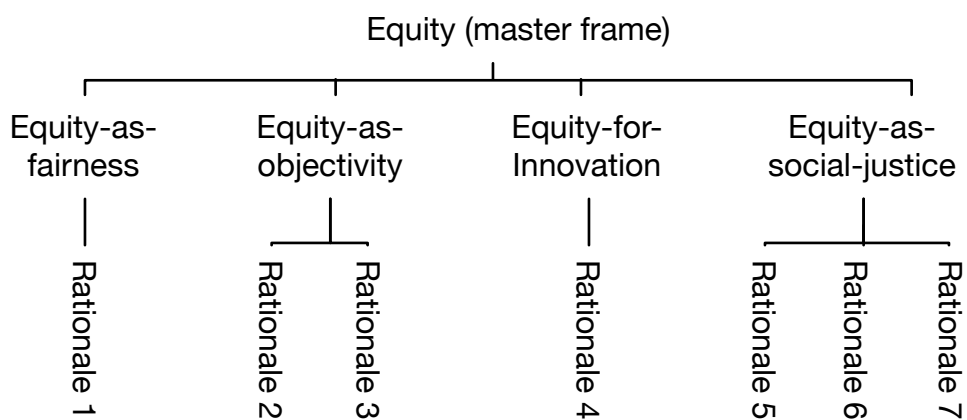
Analysis of the equity frame allows us to see the ways in which actors rationalize work and co-construct theories of value, ideas of what is possible, systems of support, and notions of authority. Equity frames position the how, why, what, and for whom in the distribution of resources. People filter frames through their value systems and identities. As such, frames get their power from the cultural resource base "tacitly elicited" in the process of problematizing conditions (Hand et al., p. 252). Some equity frames make the remediation of asymmetries in power laden systems possible while others make the reproduction of systemic inequities more palatable. In this paper, frames are used to shine analytic light on the particular configurations of equity in an organization targeting girls from minoritized communities.

Setting and Participants

This study focuses on BGBinc, an NPO founded by 3 women in 2015. BGBinc offers 6-day coding camps for high school girls interested in using technology for social impact. Students were recruited from neighborhoods across Chicago, Illinois and Kingston, Jamaica with a focus placed on underserved and marginalized communities. In Chicago and Kingston, BGBinc developed relationships with school principals and counselors to identify low socio-economic high school girls with limited prior exposure to computer science. Approximately ⅓ of the students attending camp were from relatively affluent families. The majority of funding, approximately 75%, received between 2015-2018 came from tech corporation foundations. Fundraising events and churches in Chicago contributed the remaining 25%. In addition to the 3 co-founders, four code curriculum developers and three design-thinking and leadership curriculum developers formed the core team for BGBinc. Many of the core team members were graduate students at a private university in the Midwest, and most, if not all of them came from middle class middle-income households. The co-founding team was comprised of two white American women, and one black female immigrant. I focus on the co-founding team for the purposes of this study.

The curriculum offered three modules - design-thinking, leadership, and coding (specifically HTML, CSS, and Javascript). Students were engaged in a design-thinking process that encouraged them to think through complex social issues and create a technology platform to alleviate a social problem. The 45 hours spent at camp were divided amongst the three modules in the following manner: 15 hours on coding, ten hours on design-thinking, five hours on public speaking; five hours on purpose; and one hour per day for lunch and games. During the summer

of 2017, BGBinc offered four camps, three in Chicago, IL and one in Kingston, Jamaica. 47

percent of participants across Kingston and Chicago identified as African American or Black,

10% as Latinx, 7% as Asian, 11% as White, and 7% as Other. 22% of the respondents were

Jamaican.

Methods

Data collection.

In order to understand how co-founders rationalized equity, I conducted a systematic review of

archival data from the NPO's inception in April 2015 until February 2018. The data include

formal legal documents -- contracts with service providers, 501c3 form, by-laws -- and informal

notes from weekly executive meetings taken by the three co-founders to discuss general

management. Field notes recording personal interactions captured off-the-cuff discussions about

fundraising, program expansion, and values. Audio recordings of special meetings that were

called to address issues related to hierarchy, reporting protocols, and curriculum development

were transcribed. Documents that reflected the ongoing deliberations around mission, value

proposition and roles were also included in this analysis. These documents took the form of pitch

decks, business canvases, and grant proposals.

I view these historical organizational files as discursive productions of reality (Bakhtin,

1981). In other words, these files represent real thought, real action, and real practice. They are a

representation of reality. Careful analysis of these files will require the researcher to "infer

meanings as authors frequently reveal habits of mind and assumptions only indirectly, through

their emphasis, quotations, and questions" (Colyvas & Powell, 2006, p. 315). I think of this

organization as a learning environment constituted of diverse participants (March, 1999). I think

of the organizational files as tracing the NPOs development and as such are representations of

organizational memory (Colyvas & Powell, 2006). I think of the language captured in these files

as reflecting participants' positionalities, social histories, and ideologies in discursive patterns

(Bakhtin, 1981). The table below shows a summary of data sources:

Table 1

Summary of Data Sources

File Type	No.	Description
Audio Files	2	Retreat discussing curriculum, decision making process
Contracts	3	Fiscal sponsorship contracts, by-laws
Organizational Files	25	Business model canvas, consultation documents, job descriptions, organizational charts, pitch decks
Exec meeting notes	68	Notes about programming, leadership, roles, expansion plans, board membership, board resignations, values, funding
Grants	5	Applications for funding

Data analysis.

In order to study how NPOs framed equity over time, data analysis took place over three stages.

Stage one - disturbance clusters.

I created a timeline of the organization's major developments (for example, when 501c3

papers were filed, date of pilot coding camp). I then developed a list of all the disturbance

clusters revealed in the data. Disturbance clusters are "visible discoordinations in the course of

the work and the discursive interaction includ[ed] in it" (Karkkainen, 1991, p. 111). For example, disturbances in voice reflected in disagreements or conflict amongst participants, misunderstanding, disapproval, rejection or dismissal were recorded as disturbance clusters. Additionally, language that reflected hesitation, tension, reservation, or inconsistent opinions were recorded as disturbance clusters (Karkkainen, 1999, p. 112). Including disturbance clusters as sites of contestation helped to focus analysis on turning points in BGBinc's development.

Stage two - defining equity.

I completed three rounds of coding. In the first cycle, I did inductive coding to sensitize myself to the data and gain a better understanding of the data set as a whole (Miles, Huberman, & Saldana, 2014). I then consulted the literature on equity in STEM education (reviewed above), and more broadly, equity in Learning Sciences to concretize and formalize the concepts I was seeing. I created equity codes organized by types of rationale, ranging from fairly conservative to more progressive approaches to equity[2]. I then narrowed down the list of disturbance clusters to issues relating to equity. Of the 14 disturbance clusters, seven were related to equity. In the third round of coding I expanded my list of codes to include forms of equity work not captured in the literature. For example, equity-as-pluralism was a new frame that emerged during data analysis. See the frequency table below for the list of equity frames and rationales absent from and present in the sample.

Stage three - creating narratives.

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[2] I use the terms conservative and progressive to indicate relativity. The more conservative frames are defined by their allegiance to the status quo. Progressive frames are defined by more radical, systems-changing approaches to equity work

I created narratives that combined various data sources to trace the unfolding of one particular disturbance cluster. I then wrote analytic memos to describe the equity rationales engaged for each disturbance cluster. Data displays showed the interaction of the various conservative and progressive equity rationales.

Findings

I argue that co-founders grappled with multiple equity frames to remain relevant and solvent. At times, this negotiation reflected founders' conflicting values and visions for what equity should mean and how it should be expressed. This was particularly evident when seeking funds from external parties. Findings are organized around three types of scenarios – 1) when co-founders established the NPO's mission in its early stages, 2) when co-founders had divergent political views, and 3) when the organization engaged external funders. In the following section, I present a frequency table showing the list of equity codes and their prevalence throughout the analysis.

Table 2

Frequency table for equity frames and rationales

Frame	Rationale	Frq	Source
Equity-as-fairness	Equity work that upholds colorblind approaches or policy, advancing equal treatment for all	3	Philip & Azevedo, 2017
Equity-as-social-justice	Diversity work important so that minoritized individuals have access to scientific training and education.	4	Philip & Azevedo, 2017; Intemann, 2009
	Equity work respects and welcomes learners' multiple social identities	1	Vakil, 2018;
	Inclusion of minoritized individuals to meet the demands of the STEM workforce	6	Philip & Azevedo, 2017

	Equity work that reveals the social and political implications of technology	0	Vakil, 2018
	Equity work that remedies past injustices experienced by minoritized communities	0	Philip & Azevedo, 2017
	Diversity work ensures the well-being (social and economic welfare) of minoritized groups	9	Intemann, 2009
	Equity work embedded in social justice movements that reconfigure the relationship between STEM, power, and justice	0	Philip & Azevedo, 2017
	Equity work that helps learners understand and reimagine the relationship between science, power, and justice	0	Vakil, 2018; Philip & Azevedo, 2017
	Equity work: inclusion in STEM community	5	
Equity-for-innovation	Diversity work needed for innovation / progression of science.	2	Intemann. 2009
	Diversity work needed to maintain America's global economic competitiveness, national security, and military domination	0	Vakil, 2018
Equity-for-objectivity	Diversity makes scientific communities less biased	0	Intemann, 2009
Equity-for-pluralism	Diversity makes scientific communities tolerant	1	
	Equity focus on individual student choices	10	

As discussed in the literature review above, equity is a politically charged (and in some cases personally significant) frame casting a wide net for interpretation, pedagogy, and practice.

Early stages.

In the section below, I show how the organization framed equity in the early stages, within the first month of founding. The following was taken from the mission statement in the first pitch deck presented to a public audience.

1   We believe that all people have the ability to code [equity-as-fairness],

2   but many hold themselves back [equity-focus on the individual]

The equity-as-fairness frame was infrequently used. Across all the organizational files examined in this study, this frame emerged thrice in the data. In line 1, the focus is placed on *all people*, signifying that everyone, regardless of gender, has the ability to code. This framing of the problem, that everyone can code, "but many hold themselves back" suggests that those who lack the ability to code do so by choice. As shown above, the equity-as-fairness frame is followed by the equity frame that places focus on the individual. It is the individual's choice, the girl's decision to opt-out of coding (and not the inequitable system) that needs to be remediated. Consequently, programming that centers self-efficacy and fearlessness is offered as the solution. This passage also suggests that all girls, regardless of their multiple identities, will receive the same treatment. The excerpt continues:

1   To change this, we run a 5-day coding camp that gets participants involved in the creative

2   and enthralling process of developing technology for social impact. Participants immerse

3   themselves in relevant community issues which they feel passionate about and prototype

4   solutions to these issues. Participants come away from the camp with fearlessness and

5   self-efficacy towards computer science and their abilities to design solutions using tech

6   that betters their communities and ultimately the world [equity-for-well-being]

This version of the mission statement, written 1 month before their pilot program, was the first

document on file that captured BGBinc's attempt to frame their service as a fundable program. In

addition to the equity-as-fairness frame, the excerpt above shows how an equity-for-wellbeing

rationale is used in service of the overall goal – to get more girls into coding.

The way in which an NPO problematizes an issue, the objective conditions that become

subjective problems (Kingdon & Thurber, 1984), determines the type of solution that remediates

that issue. Thus, if the problem is located in the lack of will, motivation, ability, or courage of the

individual, then the equitable solution is to fix the individual's lack of something. Individual-

oriented action does not preclude systems-level action nor does it necessitate a deficit-based

pedagogy. However, this excerpt is reflective of the wider sample. Equity work focused on the

individual emerged 10 times in the data and was the most frequently used code in the sample.

Political contention.

In the section below, I argue that different equity frames were used to settle co-founder's

divergent political views. I offer an excerpt from a grant proposal, then analyze the ways in

which 3 frames interactionally produce a value-agnostic stance on a politically fraught topic. In

a grant proposal written to a Chicago-based foundation that funds programming for women and

girls, BGBinc was asked two questions, "how does the organization support a woman's right to reproductive justice?" BGBinc responded below:

1   <u>We support a young girl's right to create any solution they deem necessary to address</u>

2   <u>social issues like reproductive justice.</u> [equity-as-fairness] Our design-thinking exercises help

3   our students to reframe social problems they experience into specific, tractable

4   sub-problems that they can solve. <u>This process invites them to reflect on their experiences,</u>

5   <u>interrogate their ideas and view the problem from a variety of perspectives</u>. [equity-as-pluralism]

6   Our students are taught how to create and conduct user interviews so that they may learn

7   from another's experience and design systems and solutions that address a variety of needs.

8   <u>We challenge them to develop interventions that root out deeply systemic policies and</u>

9   <u>prejudices with accessible and thoughtful solutions.</u> [equity-for-social-justice] Every

10 solution is given the full support of our coaches, mentors, and staff.

In the excerpt above, the quote in line 1, "creat[ing] *any* solution" to any and all social issues, is presented like a blanket neutral statement -- all ideas are welcome. This suggests that all ideas will have an equal opportunity to be aired and addressed. This equity-as-fairness frame is supported by an equity-as-pluralism frame. The equity-as-pluralism frame appeared only once in the data. The quote in lines 4-5 goes on to explain that in the sharing of these multiple ideas, participants will engage in perspective-taking. It suggests that the "interrogat[ion]" of these ideas will lead to an objective representation of the issue. These two frames produce a type of value-agnostic rationally neutral response to a politically charged question. If the quote had instead said, "we support a young girl's right to create any solution to advance reproductive justice" one could infer the organization's stance on the topic of reproductive justice. The equity-as-pluralism

in interaction with an equity-as-fairness frame shows how BGBinc used conservative frames to project a progressive stance on a politically contested topic.

The excerpt wraps up with a fairly bold equity-as-social-justice frame. In lines 8-9 BGBinc suggests that the objective of this work is to help students "root out deeply systemic policies and prejudices" through their unique combination of design-thinking and computer science education. The interaction of these three frames presents an interesting rhetorical move used by BGBinc to appease the concerns of the funder while covering the disparate political views within the organization. One co-founder was staunchly pro-life while another was pro-choice. This statement appears to be the compromise.

The interaction of these frames suggests an alternative explanation. One could infer that the work of creating any solution, in service of any and all social issues, through an objective inquiry-process that takes into consideration all perspectives in a value-agnostic setting could lead to a deep understanding of systemic issues. This holistic understanding of the world could help students advance thoughtful solutions that remediate oppressive power-laden systems and structures. I find this explanation to be less convincing given the differing stances on the morality of abortion. This excerpt shows that when political views within the organization are divergent, founders must delicately balance internal perspectives to offer a cogent and coherent representation of their work that delivers value in the ways defined by the funder. In the section below, I show the ways in which the organization wrestled with equity while seeking funding support.

Eking equity while seeking funding.

In the sections below, I argue that co-founders grappled with multiple frames when seeking funding, including equity-for-wellbeing, and inclusive-STEM-workforce and to a lesser extent, equity-for-innovation, and equity-for-identity. Social-justice equity frames were notably present; however, the more radical social-justice frames were notably absent. I discuss the significance of the silence surrounding the more radical social-justice frames.

Grants: equity as inclusion.

In one of the first and largest grants written to a tech corporation to secure, BGBinc stated, "[our] objective is to expose young girls to pertinent skills that they can use to pursue a STEM career." When asked to explain "how the program moves participants through the STEM pipeline to more advanced STEM education or career pathways," BGBinc described three channels for student advancement in STEM fields: building self-efficacy, supportive peers and mentor community, and continual skill-building through workshops and reunions. It is no surprise that a non-profit coding camp would have to make an argument to a tech foundation that their work furthers the goals of the parent tech company. In fact, the movement behind women and people of color in STEM is founded on the idea that inequitable access to quality science and engineering education is part of the reason for the gap in STEM labor force participation. What is notable here is the way in which BGBinc used varying equity frames to make that argument. The excerpts below show the mission statement written in grants submitted in 2016 and 2017 to the same tech foundation. Both grants were successful.

> Our mission is to create social impact through design-thinking and tech empowerment. The objective is to expose young girls to pertinent skills that they can use to pursue a STEM career. The idea is to encourage the girls to see themselves as capable engineers and tune them into community issues that they might normally ignore or accept as status

quo. We aim to agitate them into being social change-makers and community development engineers. (2016)

BGBinc strives to create social impact by equipping young girls with the skills and self-confidence to be community change-makers. Our mission is to empower girls from underserved communities through training in coding, design-thinking, leadership, and self-love. By participating in our programs, girls not only learn pertinent skills that will enable them to pursue careers in STEM-related fields in the future, but also develop the ability to identify and address community issues in the present. In doing so, they learn to see themselves as social change-makers and community development engineers. (2017)

The excerpts above use girls' inclusion in the (future) STEM workforce as a rationale for equity work. Inclusion for community wellbeing is positioned as the overall mission but (as mentioned above) the focus of equity work is operationalized at the individual level (i.e. girls must *choose* to pursue STEM and it is the NPO's job to "*encourage*" them to do so). The subtle difference between the two excerpts is a sharpened focus on time frames and underserved communities in the 2017 grant. BGBinc postulates that educating girls from underserved communities in an interdisciplinary fashion will benefit their communities today and will groom them for the tech jobs in the future. The inclusive-STEM-workforce rationale has been an effective strategy to galvanize support for targeting girls and youth of color. However, in this dataset, the more pervasive rationale was equity-for-wellbeing. As mentioned above, one of BGBinc's major goals is to have "participants immerse themselves in relevant community issues they feel passionate about and prototype tech-based solutions." This rationale emerged nine times in the data mostly in documents that required a description of the program or a mission statement as shown above.

Grants: equity and identity.

The issue of identity came up only once in my analysis of organizational files. In a grant, a Chicago-based foundation serving women and girls asked a question not usually asked by tech

foundations concerned with STEM education writ large - "how does the organization provide a respectful environment for LGBTQ people?" In 2016, BGBinc wrote:

> The mentor-camper relationships that we hope to establish in these young people's lives are based on their personal journeys and identities, and we're focused on creating a culture of inclusivity and empowerment.

The absence of this rationale speaks volumes. While BGBinc targets a minoritized community (girls), sub-groups within that community are not explicitly named. Their identities were never referenced in mission statements, grants, pitch decks, or marketing materials. BGBinc merely states that girls from underserved communities are targeted. However, the demographic breakdown of participants is shared in grants that explicitly request that information. Externally, BGBinc does not problematize or address the role that identity (i.e. racial/ethnic, religious, sexual, diasporic etc.) plays in STEM beyond acknowledging the gender gap in the STEM workforce between women (and women of color) and men. Internally, identity, its relevance to the organization and its place in the curriculum was a hotly contested issue. Identity activities were added to the BGBinc design-thinking curriculum in 2017 and modified several times over in the spirit of compromise. In other words, while identity was central to student engagement and curriculum development, externally, identity was not central to the story told to funders. To raise funds, it was enough to claim working with underserved populations. The NPO did not need to demonstrate that students' multiple identities were respected, welcomed, and meaningfully engaged until one funder explicitly asked for that information. This excerpt shows how internal political contentions can be heightened based on the funders calls to grapple with particular issues.

Informal meetings with funders.

In discussions with a high-profile tech CEO from Silicon Valley interested in funding the NPO's expansion, BGBinc presented its goal to "raise the next generation to be equipped to create technology that is both socially-conscious and technically innovative." Here, the equity-for-innovation frame suggests that the purpose of recruiting women into the tech field is so that technology at the frontier is pushed forward in generations to come. It also couples the idea of innovation with the concept of social good. In a meeting document used to facilitate the conversation with the tech CEO, BGBinc writes:

> These young women will be on the frontier of technology, capable to push companies to build technology for people, and/or create their own companies that build tech solutions for communities they care about.

The concept of social good, represented here as the creation of technology for the good of the people and their communities is an example of an equity-for-social-justice frame. The combination of these two frames -- innovation and social justice - represent BGBinc's dual goals. The equity-for-innovation frame emerged in the data only once and did so in discussions about scale. The tech CEO asked the co-founders to think about how they could expand their services to impact 100 million girls. In noted debriefs, one co-founder explained,

> Just saying a number of women to impact is not enough. Our approach to this problem needs to be built on an ecological framework that takes context into consideration. The girls need to feel like they are a part of a community with mentors who care about their emotional, social, and professional development. It is undeniable that technology will play an important role in molding our future society. The question is, what role SHOULD technology play in the future? I read an article written by Emily Pierson, a Stanford CS PhD student, in Wired Magazine. She said, "the fact that so many computer scientists are ignorant or disdainful of non-technical approaches is worrisome because in my work, I'm constantly confronting questions that can't be answered by code."

In her notes recorded on May 14, 2017, the same co-founder concluded, "computational thinking needs to happen at the nexus of the technical and the social." This topic - scale, for which communities, and when - becomes a point of tension in later discussions about where to take BGBinc. For example, executive meeting notes on May 31, 2017 showed co-founders discussing expanding BGBinc to Kingston, Jamaica. One co-founder explained that she needed proof of "financial buy-in," since the crowdfunding campaign that was launched failed to raise funds from Jamaican or Jamaican-based residents. She took this as a sign that the community was "not ready" to work with a U.S-based non-profit. Another co-founder questioned whether crowdfunding support was a sign of community buy-in since the campaign did not target the beneficiaries (which were high school girls from underserved communities in Kingston and their families). Rather, the campaign targeted associates of that co-founder. This question of scale becomes an equity issue when one considers the role that funding plays in determining which communities to cater to. While grappling with the tech CEO's question of how to commit to the idea of serving 100 million girls worldwide, the co-founders also struggled to make a case for 20 girls in Kingston, Jamaica. The difference between the two cases was the "financial buy-in" offered by the tech CEO.

Silence on justice.

In this section, I show how the NPO wrestled with multiple social-justice equity frames while seeking funding by highlighting the silence on the more radical frames. As shown in Table 2 above, there were 4 social-justice rationales that were not reflected in the data – 1) equity work that reveals the social and political implications of technology, 2) equity work the remedies past injustices experienced by minoritized communities, 3) equity work embedded in social justice

movements that reconfigure the relationship between STEM, power, and justice, and 4) equity

work that helps learners understand and reimagine the relationship between science, power, and

justice. These four rationales are the more radical of the equity for social justice frame. They

require a deep critical engagement with inequitable structures and a reconfiguring of power

relations.

By contrast, the three equity-for-social-justice rationales that were present in the data were: 1)

diversity work that ensured the well-being (social and economic welfare) of minoritized groups

(appeared in the data nine times) , 2) inclusion in the STEM community (appeared five times)

and 3) inclusion to diversify the STEM workforce (appeared five times). These three rationales

are more conservative in their framing of social justice because they advocate for

representational diversity while supporting the ideological status quo. The presence of language

that focused on inclusion in the absence of language that advocates the reconfiguring of power

structures reflects a type of well-intentioned, surface-level equity work in two ways. First,

representational diversity, by itself, does little to undermine sexist and racist organizational

practices, routines, and narratives (Ahmed, 2012). Second, the inclusion of a more diverse group

of people does not necessitate the reimagining of normed power relations. Disruption of the

status quo requires active engagement in the shifting of practice and re-centering of non-

dominant epistemologies.

 It is possible that what we are witnessing is an NPO's strategic use of language to secure

funds. One could argue that what is written in grants caters to the funders' visions, but how the

funds are actually spent could advance more radical notions of equity-for-social-justice. Given

that these three co-founders had divergent political values around what it meant to engage in

equity work, it is unlikely that systems-changing, politically fraught work was meaningfully executed. Engaging with more radical forms of equity for social justice would require that the organization be united in resisting, negotiating, and refusing particular dominant relations. By dominant relations, I am referring to power asymmetries that are saturated by racism, sexism, and classism, between students and NPO representatives, between students and the dominant epistemologies within STEM, between NPO representatives, and between the NPO and funders. If the organization is not trying to undermine the status quo, to some extent, it reproduces those relations (INCITE, 2007).

Discussion and Conclusion

Equity-oriented work is fundamentally about questioning whose values, agendas, politics, socio-emotional needs matter. Who is prioritized and when? What are the ends and how are the means justified? I demonstrated how a STEM-focused NPO actualized equity by highlighting three key levers - individual alignments, need to remain solvent, and expressed interest of funders. Below, I offer a framework that pulls together the equity rationales revealed through data analysis and considers the wider implications of these equity frames by sharing potential impact on practice.

	Frame	Rationale	Targeting	Partnering Priorities	Funding Structure	Curricular Constructs
			Table 3 showing equity frames and its impact on targeting, partnering priorities, funding structures and curriculum			
Conservative	Equity-as-fairness	Equity work that upholds colorblind approaches or policy, advancing equal treatment for all	Programs do not directly target under-represented groups (like youth of color, youth living in rural areas, youth with disabilities) Programs use wide-net recruitment strategies to get as many students as possible	Programs partner with disrcts or hubs that offer access to many groups of students	Funding can come from federal, state, districts, corporations. Any and all funding mechanisms are equally viable	Curriculum is value-agnostic and politically neutral. Academic disciplinary content is likely the focus of the curriculum. It is unlikely that community issues or needs are referenced or addressed
	Equity-as-objectivity	Diversity is needed to make scientific communities less biased	Programs directly target youth from under-represented/minoritized groups	Programs partner with schools, associations, community organizations that serve or work with predominantly minoritized groups	Funding can come from federal, state, districts, corporations. Any and all funding mechanisms are equally viable. National Science Foundation is a likely source	Curriculum is value-agnostic and politically neutral. Academic disciplinary content is likely the focus of the curriculum. It is unlikely that community issues or needs are referenced or addressed
>>>>>>	Equity-for-innovation	Diversity needed for innovation or progression of science. "It is possible that the best and brightest minds will be erroneously exlucded" if supports not put in place to remove barriers from their participation (Intemann, 2009, p.252)	Programs directly target youth from under-represented/minoritized groups	Programs partner with schools, associations, community organizations that serve or work with predominantly minoritized groups	Funding can come from federal, state, districts, corporations. Any and all funding mechanisms are equally viable. National Science Foundation is a likely source	Curriculum is value-agnostic and politically neutral. Academic disciplinary content is likely the focus of the curriculum. It is unlikely that community issues or needs are referenced or addressed
		Diversity needed to maintain America's global economic competitiveness, national security, and military domination (Vakil, 2018)	Programs directly target youth from under-represented/minoritized groups	Programs partner with schools, associations, community organizations that serve or work with predominantly minoritized groups	Funding can come from federal, state, districts, corporations. Any and all funding mechanisms are equally viable.	Curriculum is value-agnostic and politically neutral. Academic disciplinary content is likely the focus of the curriculum. It is unlikely that community issues or needs are referenced or addressed
>>>>>>	Equity-as-social-justice	Minortized groups gain access to (potentially lucrative) STEM professions.	Programs directly target youth from under-represented/minoritized groups	Programs partner with corporations to provide connection to potential job opportunities. Programs parter with schools, associations, community organizations that serve or work with predominantly minoritized groups	Funding from tech corporations might be easiest to access since these corporations stand to benefit the most from workforce development training	Curriculum focuses on building skills for which there is a gap in the labor force. Professional or STEM-identity is core part of curriculum
		Access to STEM training and education for minoritized students	Programs directly target youth from under-represented/minoritized groups	Programs partner with schools, associations, community organizations that serve or work with predominantly minoritized groups	Funding can come from federal, state, districts, corporations, philanthropic associations. Any and all funding mechanisms are equally viable	Curriculum is value-agnostic and politically neutral. Academic disciplinary content is likely the focus of the curriculum. It is unlikely that community issues or needs are referenced or addressed. Professional or STEM-identity is core part of curriculum
Progressive		Access to STEM training and eductaion for minoritized student that engage identity work	Programs directly target youth from under-represented/minoritized groups	Programs partner with schools, associations, community organizations that serve or work with predominantly minoritized groups	Funding can come from federal, state, districts, corporations, philanthropic associations. Any and all funding mechanisms are equally viable	Curriculum uses a culturally-relevant framework that engages student identities and repertoires of practice. Students' multiple identities are respected and welcomed (potentially engaged and advanced). STEM-identity is seen in intersection with other identities.
		Access to STEM training and education for minoritized studens that reveals the social and political implications of technology and reimagine the relationship between science, power, and justice (Philip & Azvedo, 2017).	Programs directly target youth from under-represented/minoritized groups	Programs partner with schools, associations, community organizations that serve or work with predominantly minoritized groups	Funding could come from tech corporations and other philanthropic associations. Funding could also come from the beneficiaries themselves	Curriculum highlights sociopolitical dimensions of technology historically and present-day. "Focuses on individual rights and freedoms, and corporate and government responsibilities. Critique of unethical abuses of technological power. Understanding role technolgy can play toward social justice goals" (Vakil, p. 13).
		Equity work embedded in social justice movements that reconfigure the relationship between STEM, power, and justice (Jurow & Shea, 2015 ; Philip & Azevedo)	Programs are run by social justice organizations	Programs partner with organizations that are value aligned and/or further their cause.	Funding from beneficiaries are prioritized (INCITE, 2007). Grassroots funding methods are used	STEM concepts are used as tools to further the mission of the movement. Epistemological supremacy of STEM (what counts as STEM) is challenged as STEM is embedded in collective action (Philip & Azevedo, 2017

The [table above](#)[3] shows equity frames, their rationales and potential impact on targeting,

partnering priorities, funding structure and curricular constructs. These frames were arranged

along a somewhat non-linear spectrum ranging from more conservative equity frames to more

progressive frames. I use the term non-linear to emphasize that each successive rationale might

be just equally conservative or progressive as the former. Conservatism is defined by its

allegiance to the status quo. The equity-as-fairness, equity-as-pluralism, and equity-as-innovation

frames simply broaden participation. Equity-as-fairness programs will target all youth groups

whereas equity-as-pluralism and equity-as-innovation programs will target underserved groups

like girls, youth of color, youth living in rural areas, the LGBTQIA youth etc. These programs

will partner with institutions that serve these minoritized youth and funding will likely come

from federal/state agencies, districts and tech/engineering corporations. However, curricula are

unlikely to meaningfully engage youth's multiple identities and cultural practices. Curricula will

likely present disciplinary content as value-agnostic and politically neutral. The unethical ways

in which STEM has been used to exploit, harm, and even kill minoritized groups in the past and

present will likely not be addressed or problematized (Philip & Azevedo, 2017).

Equity-as-social justice leans conservative in some ways, and progressive in others.

Rationales that argue for "minoritized groups' access to STEM professions," and "access to

STEM training," further the goals of corporate capitalist organizations and only make an

economic argument for minorities' participation in the STEM field -- minoritized groups gain

access to potentially lucrative STEM professions. This is not insignificant, but it does reveal

under theorized notions about what success for minorities in STEM should look like. For

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[3] A link to a google sheet is provided to allow the reader to zoom in.

example, what does it mean to carry out the work of plugging the leaky STEM pipeline if when women of color join the STEM workforce they get paid less and must navigate a caustic and competitive 'bro' culture (Uttamchandani, 2018)? Programs that focus on building STEM-identity while forsaking intersectionality will not offer youth strategies to survive and thrive in that type of environment. (It should also not be the responsibility of recruited minoritized employees to change the culture of the workplace, if that was even possible to do solo). The more progressive equity for social justice rationales written in the table are "access to STEM training that engages identity work," "STEM training that reveals the social and political implications of STEM," and "equity work that is embedded in social justice movements." Programs that subscribe to these rationales will also target minoritized youth and partner with institutions that serve these youth. The major difference is in curricula. Curricula will not only welcome and respect students' multiple identities but will also engage and advance these identities, deepening students' awareness of their individual and communities' positionalities. In the case where STEM education is embedded in social justice movements, systems-level change is a real possibility. STEM that is used as a tool for collective action challenges the epistemological supremacy of STEM (Philip & Azevedo, 2017). Science and technology matter insofar as the goals of the movement are furthered. For such revolutionary pursuit, unconventional funding that frees the organization from the lobbying efforts of large corporations will be important. Grassroots funding methods, or funding from the actual beneficiaries and members of the movement should be prioritized (INCITE, 2007).

The growing movement around CS education, in particular, reveals a hopeful and seemingly innocuous approach to building a new world while educating our youth. Calls for diversity, equity, and inclusion in the field show an intention to build equitable learning

environments by providing access to young CS learners from non-dominant communities. These are noble and worthy goals, however access is not equity. If we ask ourselves what it means to develop STEM learning opportunities for our youth, we must also ask "to what ends?" We must also question the meta-narratives that propel CS education reform in this political context, determine to what extent we align with, adjust to, and counter these meta-narratives, and consider the sociopolitical implications of this positionality. This is especially true for researchers who work with and in service of youth of color.

Study 2

Coding, Design-Thinking, and Leadership Self-Efficacy:

Shifts in Self-Perception Before and After a Coding Camp

Introduction

Self-efficacy, or one's perception of her ability to complete a task, is important to academic performance, engagement, and productive stress management (Bandura, 2006; Bandura, 1986; Pajares, 2002; Zimmerman, 2000). Self-efficacy shapes the goals that youth pursue, the activities that youth seek out and ultimately, the career paths youth chart for themselves (Stumpf, Brief & Hartman, 1987; Eccles, 1984). I study self-efficacy through three lenses. I explore STEM self-efficacy (more specifically coding self-efficacy), leadership self-efficacy, and design-thinking self-efficacy in an interdisciplinary informal learning environment. STEM self-efficacy is an important psychosocial construct that helps us to understand gender- and race-based differentials in STEM education and career participation (Ireland et al., 2016). Leadership self-efficacy is important to our understanding of how we might encourage youth to become more active community leaders and civic agents (Rehm & Selznick, 2019). Design-thinking self-efficacy is a new construct that I offer to the Learning Sciences research and designer community. Design-thinking self-efficacy measures youth's perception of her ability to generate new ideas to solve social problems. Separately, these three constructs speak to perceptions of different task-related cognitive abilities and dispositions. Together, these constructs add nuance to the abilities and dispositions (and to a lesser extent the identities) associated with being a computer scientist, civic leader, and designer.

BGBinc is a non-profit that offers civic coding camps to high school girls in select cities across the US and in Kingston, Jamaica. Their mission is to empower young women to see themselves as purposeful, powerful agents of change in their communities. This paper presents quantitative analyses on a survey administered to 57 girls before and after a 6-day bootcamp called BGB. The curriculum presented coding, design-thinking, and leadership as inter-connected, inter-dependent resources for civic engagement. Survey design was driven by programmatic goals and informed by the literature on self-efficacy and leadership development. Students were taught basic HTML and CSS, how to prototype, how to work in a team to think through complex social issues (like access to quality education and healthcare), and how to effectively communicate their ideas to an audience. Each of the exercises was intended to create a holistic experience for campers to improve their abilities as civic leaders, coders, design-thinkers and public speakers.

This paper examines change in self-efficacy in the three domains mentioned above – coding, design-thinking, and leadership. I ask two questions: 1) "Do design-thinking, coding, and leadership self-efficacy measures change over the course of a 6-day intervention? If so, by how much?" and 2) "To what extent does change in self-efficacy co-vary with age, race, prior exposure to content, and cultural context?" The three major findings are: 1) all three types of self-efficacy increase over time, 2) age, cultural context, and race did **not** have a statistically significant impact on change in self-efficacy, and 3) prior exposure to coding had a negative and statistically significant impact on coding self-efficacy.

In the sections below I present an overview of the literature on self-efficacy and describe the setting, data collected, and methods of analysis. Of the three types of self-efficacy, coding self-efficacy improved the most. In the discussion, I speculate that this is due to the lower

baseline levels of coding self-efficacy. It is also possible that the relatively marginal change in design-thinking and leadership self-efficacy scales reflects the longer time frame for new mindsets and forms of interaction to take hold. The lack of statistical significance for context, race, and age, and the impact of initial level of self-efficacy on changes in self-efficacy are discussed.

Literature Review

    Self-efficacy.

Self-efficacy, or one's belief in one's abilities to achieve a goal, is critical to persistence, emotional responses to stress, and performance (Bandura, 1986; Stumpf et al., 1987; Gist, et al. 1989). Higher self-efficacy is correlated with greater interest and engagement. As such, students with high self-efficacy tend to have higher task completion rates, particularly when faced with challenges (Stajkovic & Luthans, 1998). They also tend to perform better academically (Zimmerman, 2000). There are four major channels through which self-efficacy can be developed - mastery experience, vicarious experience, social persuasion, and physiology (Bandura, 1997; Maddux, 1995). Mastery experiences are opportunities students have had to engage in the activity. They then potentially develop the necessary skills and dispositions relevant to that task. Vicarious experiences are those offered by role models. Students learn from others' experiences and success stories. Social persuasion refers to verbal and emotional support, like positive and constructive feedback from role models. Positive physiological reactions to the task also enhance self-efficacy. If the student feels empowered, energized, or excited (as opposed to nervous, agitated, or anxious) he/she is more likely to convert those feelings to positive beliefs about ability.

Self-efficacy is also affected by the multiple social identities students carry around with them (Grossman & Porche, 2013). During adolescence, youth develop beliefs about and attitudes towards social groups that they belong to and are excluded from. Gender and racial identities become particularly salient and personally meaningful, especially for youth in heterogenous environments (Ghavami, Katsiaficas & Rogers, 2016). Youth engagement in any subject matter is to some extent affected by narratives shared in media, by friends, family, peers, teachers, and society at large. Youth internalize messages about social groups, their abilities and proclivities, and these shape expectations about their own performance abilities and what is culturally acceptable behavior (Grossman & Porche, 2013). Negative social messaging about one's own social group, or stereotype threat, contributes to lowered student achievement and self-efficacy (Steele & Aronson, 1995). As self-efficacy is specific to task performance, to leverage the explanatory power of this construct, self-efficacy should be specified within particular domains (Bandura, 2006). The following sections present a literature review of STEM, leadership, and design-thinking self-efficacies.

STEM self-efficacy.

Self-efficacy in STEM has become a central concern for Learning Scientists and education psychologists interested in encouraging STEM education for minoritized youth and girls. According to the literature, the "confidence gap" between girls and boys in their belief in their STEM abilities begins as early as elementary school. A seminal study on gender gaps in STEM efficacy published in 1991 showed that boys and girls make sense of their STEM performance differently. 52% of high school boys believed that they would enjoy being scientists, as opposed to only 29% of high school girls (AAUW, 1991). 20 years later, studies have found that this gap

has persisted. Girls tend to hold themselves to a higher standard and take average grades as an indication of lack of ability. For students with similar performance levels and past achievements, boys had a more inflated interpretation of their math skills (AAUW, 2010, p. 44). The proportion of girls interested and engaged in STEM at the high school level decreased while boys' interest and engagement increased (Sadler, Sonnert, Hazari & Tai, 2011; Sanders & Nelson, 2004). This gap in confidence is purported to be partly responsible for the lower representation of women in STEM fields (Rittmayer & Beier, 2009; Eccles 1994; Correll, 2001). According to the 2015 NSF report on Women, Minorities, and People with Disabilities in Science and Engineering, women earned only 18% of all computer science bachelor's degrees. It is important to note that many of these gender gap statistics are based on white women's or girls' experiences (Hill et al., 2010; Hanson, 2004). African American women, for example, have reported more interest in STEM education and jobs than their white counterparts. Specifically, Hanson (2004) reports that 26% of African-American women surveyed (as compared to 15% White women) 8 years out of high school indicated an interest in pursuing science by age 30. However, this interest has not translated to higher representation in the STEM field. According to a 2018 NSF report, Hispanics, Blacks, and Native Americans make up only 11% of the science and engineering workforce, less than half of their proportion of the US working age population which stood at 27% at the time of reporting (National Science Board, 2018).

Since this study works with teenagers from a variety of racial/ethnic backgrounds in a STEM learning environment, I briefly discuss the impact of social identity on STEM self-efficacy. Youth who experience stereotype threat in STEM classrooms or STEM-related contexts second guess their ability to perform well in the subject area and may be less interested in pursuing more advanced content at higher levels (Grossman & Porche, 2013). Girls often face

narratives that position STEM subjects at odds with feminine identities and roles (AAUW, 2010). Racial/ethnic minorities, particularly Black and Latinx students, deal with social messaging that position them as less intellectually capable (Grossman & Porche, 2013; Steele & Aronson, 1995; Fisher, Wallace & Fenton; 2000) and when we pay attention to intersectional identities (Crenshaw, 1990), distinctive experiences related to their multiple minoritized identities affect self-perception, performance, interest, and youth's sense of belonging (Ireland et al., 2016). In the Setting and Participants section I highlight how the design of the learning environment attended to stereotype threat and positive social identity development.

For the purposes of this paper I focus on a particular type of STEM self-efficacy I call coding self-efficacy (CSE). CSE is a person's belief in her ability to perform tasks in the computer science domain, for example using HTML to build a website.

Leadership self-efficacy.

Research has shown that youth programs that focus on leadership development enhance youth civic competencies (O'brien & Kolmerier, 2003), problem solving abilities (MacNeil, 2000), self-esteem and high school graduation rates (Bloomberg, Ganey, Alba, Quintero & Alcantera, 2003), and connections with the community (Zeldin, McDaniel, Topitzes & Lorens, 2001; O'brien & Kohlmerier, 2003). Youth are also well positioned to address issues that other youth experience (Zeldin et al., 1991). In this article, I focus on the leadership judgements of high school youth engaged in social impact work in small groups within a coding camp. Leadership was taught through team problem solving activities in the camp. Students worked in teams of 3 to 5 to problematize a social issue they experienced and construct a technology platform to alleviate that issue.

There is no one set agreed upon definition of leadership in the literature. Like "learning", multiple definitions motivated by varying values and research agendas exist. A review of the management and organizational behavior literature reveals a few common themes. Leadership can be seen as: a process of social influence (House and Baetz, 1979; Rauch and Behling, 1984; Yukl, 1998) ; voluntary followership, where people willingly allow themselves to be guided by someone (House and Baetz, 1979; Kotter, 1988; Paglis, 2010) ; strategizing and/or directing a group or organization to pursue a common goal (Kotter, 1990; Yukl & Van Fleet, 1990).

Broadly, leadership self-efficacy (LSE) may be defined as a leader's belief in her ability to achieve goals relevant to her leadership role(s) (Chemers, Watson & May, 2000; Kane, Zaccaro, Tremble & Masuda, 2002). In the literature, LSE has been connected to problem solving, judgement, taking initiative (Watson, Chemers & Preiser, 2001; Anderson 2008; Taggar & Seijit 2003; Hannah, Avolio, Walumbwa & Chan, 2012), planning, communication, motivating team members (Chemers et al., 2000; Ng, Ang, & Chan, 2008), and idea production (Gist, 1989). In 2008, Anderson et al., published a taxonomy of LSE which produced 88 leadership attributes and 18 dimensions in an LSE inventory. These dimensions included terms like Change, Drive, Build, Relate, Guide, Communicate, and Serve. As noted by Paglis (2010), scholars engaged in LSE research must ground their work in the theoretical foundations of self-efficacy research while paying close attention to the type of leadership called into question in context. His work with Greene in 2002 focused on leaders "driving change and continuous improvement at work" with specific attention to tasks that had leaders "set a direction, gain followers' commitment to change goals, and overcome obstacles to changes" (Paglis & Green 2002, p. 217). To date, not much has been published on leader development for the K-12 youth population (Murphy & Johnson, 2011), and much less on youth LSE (Rehm & Selznick, 2019).

Up until the time of writing, a leadership self-efficacy measure for youth below the collegiate level did not exist. Very recently, Rehm and Selznick published a 5-item youth leadership self-efficacy scale that was tested by 120 8th-graders (Rehm & Selznick, 2019).

I use Socially Responsible Leadership as a framework to devise a leadership self-efficacy construct that is more directly tied to programmatic goals. The Socially Responsible Leadership Scale (SRLS) was created to operationalize the Social Change Model of Leadership Development pioneered by the Higher Education Research Institute in 1996. While this model was created for college-level students and takes a longer-term developmental view on leadership, it provides a useful civics-oriented framework to assess shorter-term changes in leadership self-efficacy in this context. Within the social change model, leadership is defined as a "purposeful, collaborative, values-based process that results in positive social change" (Komives & Wagner, 2016, p.xii). The values motivating the model are the following – consciousness of self, congruence, commitment (operating at the individual level), collaboration, common purpose, controversy with civility (operating at the group level), citizenship, and change (operating at the societal level). SRLS translates those eight values into scales, of which I use six. The table below defines each value and includes example questions from the survey administered in this study.

Table 3

Leadership values adapted from the Social Responsibility Leadership Scale

Value	Definition	Survey item (e.g.)
Consciousness of Self	Awareness of the beliefs, values, attitudes, and emotions that motivate one to take action. Comfort in expressing oneself.	I am confident in my public speaking. I believe I can inspire others.
Commitment	The psychic energy that motivates the individual to serve and that drives the collective effort; implies a passion, intensity, and duration, and is directed toward both the group activity as well as its intended outcomes.	I want to be able to learn about others' experiences to be able to help them.

Collaboration	To work with others in a common effort; constitutes the cornerstone value of the group leadership effort because it empowers self and others through trust.	I enjoy working on a team with others.
Controversy with civility	Recognizes two fundamental realities of any creative group effort: that differences in viewpoint are inevitable, and that such differences must be aired openly but with civility. Civility implies respect for others, a willingness to hear each other's views and the exercise of restraint in criticizing the views and actions of others.	I am good at conflict resolution. I am good at listening to others.
Citizenship	The process whereby an individual and the collaborative group become responsibly connected to the community and the society through a leadership development activity. To be a good citizen is to work for positive change on the behalf of others and the community.	I believe that I can make a difference in my school and community.
Change	Change serves as the hub of the model reflecting the process of engaging in leadership to contribute to a better world.	I feel like I can make a difference.

Reproduced and lightly modified (Dugan, 2015, p. 25)

Because SRLS is a longitudinal assessment of college students' leadership development, the

measures used in this research study are modified to suit this intervention's shorter time span and

younger age group of the participants. The two scales omitted from the SRLS were Congruence

and Common Purpose. Congruence, defined as "thinking, feeling, and behaving with some

consistency, genuineness, authenticity, and honesty towards others; actions are consistent with

most deeply-held beliefs and convictions" (Dugan, 2015, p. 25), is a value that can only be truly

examined over longer periods of time. Common Purpose, defined as "work[ing] with shared

aims and values; facilitates the group's ability to engage in collective analysis of issues at hand

and the task to be undertaken," (Dugan, 2015, p. 25) will be explored using transcribed video of

group interaction in future research.

Design-thinking efficacy.

Human-centered design began as the counterpoint to rote user testing. Its contribution to the field was centering the human subject and values like empathy in the problem-solving process. A type of human-centered design is design-thinking. Design-thinking is a 6-step process that designers can use to articulate a social problem and prototype solutions to address that problem. Design-thinking programs have grown rapidly in the last 15 years. Dozens of design-thinking schools have emerged in the higher-education institutions in America alone (Wu, 2017). The design-thinking process is animated by particular mindsets that encourage collaboration and experimentation. The Stanford d.school version of design-thinking offers seven mindsets – show don't tell, focus on human values, craft clarity, embrace experimentation, be mindful of process, bias towards action, and radical collaboration. For a full explanation of these mindsets see Appendix A.

Design-thinking self-efficacy (DTSE) does not currently exist as a validated psychometric construct. Instead, design-thinking theorists have used terms like creative self-efficacy, creative growth mindset, creative agency, and creative confidence in their exploration of self-efficacy within design-thinking practice (Hawthorne et al., 2016; Sadler, Shluzas, Blikstein, & Katila, 2016; Jobst et al., 2012; Royalty & Roth, 2016). Creative self-efficacy was introduced by Tierney and Farmer in 2002 to measure workers' beliefs in their creative capabilities. Tierney and Farmer examined creative self-efficacy in relation to job tenure, job self-efficacy, job complexity, and supervisor behavior. In design-thinking education courses, students are often tasked with solving or alleviating complex, wicked problems. Wicked problems are, "[a] class of social system problems which are ill-formulated, where the information is confusing, where there are many clients and decision makers with conflicting

values, and where the ramifications in the whole system are thoroughly confusing," (Buchanan, 1992, p. 15). To "train the future innovators" (Jobst et al., 2012, p.2) of society, tasked with solving the wicked problems of our generation, it is thought that a strong sense of creative self-efficacy is needed.

I do not explicitly measure creative self-efficacy, though there is one survey item that could be seen as a measure of the construct ("I feel like I can design creative solutions to problems"). Instead, the DTSE construct in this study is derived from the BGB activities and design-thinking mindsets. For example, in the pre- and post- surveys I ask students to indicate on a 5-point likert scale to what extent they agree with the following statements: I am confident interviewing others, I am good at giving and receiving feedback, I am comfortable building a paper prototype, I feel comfortable adding to my work to make it better.

Conceptually, there is some overlap between LSE and DTSE. The spirit behind design-thinking, particularly the radical collaboration mindset, could be seen as one way to orient youth leaders. Similarly, the ethos of leadership – working in a team to complete a task, building a culture of engagement or norms for interaction, supporting each other's ideas, engaging divergent perspectives – could be seen as a necessary pre-requisite to solving the world's wicked problems. In this case, LSE is more a measure of agency whereas DTSE focuses on tasks associated with scoping an issue and prototyping solutions.

Data

I administered pre- and post-surveys to determine whether and to what extent the intervention positively affected students' perceptions about themselves as agents of change, designers, and coders. Survey questions provided students options to choose how strongly they

agreed or disagreed with question prompts across a 5-point likert scale. These questions served

as one type of learning assessment for the three modules (design-thinking, coding, and

leadership) taught throughout the camp. As a result, the learning objectives tied to specific camp

activities were written into the survey questions. For example, participants were asked, "Please

rate how much you agree/disagree with the following statement – 'I believe that I can make a

difference in my community'." See Appendix A for a full list of the questions. Of the 57 students

who attended BGB during the summer of 2017, 47 completed both pre- and post- surveys.

Methods

      I used two approaches to assess the statistical significance of change between pre- and

post-survey questions and constructed self-efficacy scales. First, I analyzed regressions with

control variables for key demographic covariates to determine the extent of change over time

(see equation below). Second, I ran regressions where the covariates were included as dummy

variables to see differences across racial groups, camps, and age groups (see equation 2 below).

As mentioned above, the sample size is 57.

Equation 1:

$$Q_n = \beta_0 + \beta_1 T_{itc} + \beta_2 Race_{itc} + \beta_3 Age_{itc} + \beta_4 Camp_{itc} + \beta_5 Prior_{itc} + \varepsilon_{itc}$$

Where i is the individual, t is time (in this case there are two time periods), and c is the camp (in

this case there are 4 camps). Q_n is the response to the nth question in the survey, T is a dummy

variable that is 1 for post-survey responses, and zero for pre-survey responses, *Race* is a

categorical variable with 8 categories (White, Black or of African descent, non-white Hispanic or

LatinX, Asian/Pacific Islander, Black and Asian, LatinX and Native American, White and Asian,

and Other), *Camp* is a categorical variable ranging from 1 to 4 for each camp, *Prior* is a dummy

variable that is 1 if the student attended a design-thinking or coding program prior to camp, and

zero otherwise, and ε is the error term.

The key coefficient here is β_1 which shows the change between pre- and post- survey

measures. Race, age, camp, and prior exposure were included as control variables. This

coefficient answers Research Question 1 (do self-efficacy measures change over the course of a

5-day intervention? If so, by how much?)

Equation 2:

$$Q_{\Delta n} = \beta_0 + \beta_1 RaceDummy_{ic} + \beta_2 Age_{ic} + \beta_3 CampDummy_{ic} + \beta_4 Prior_{ic} + \varepsilon_{ic}$$

Where i and c are the same as above. $Q_{\Delta n}$ is the change in response from pre- to post- measures

to the nth question in the survey. Unlike equation 1, *Race* is a set of 5 dummy variables with the

following criteria: race variable A is 1 if the individual is white, and zero otherwise; race

variable B is 1 if black and zero otherwise; race C is 1 if LatinX and zero otherwise; race

variable D is 1 if Asian and zero otherwise; and finally race variable E is 1 if bi-racial/mixed race

and zero otherwise. *Camp* is a set of 4 dummy variables with the following criteria: Camp 1, 2,

3, or 4 turns on if individual attended Camp 1, 2, 3, or 4 respectively, and is zero otherwise. Like

equation 1, *Prior* is a dummy variable that is 1 if the student has attended a design-thinking or

coding program prior to camp, and zero otherwise. ε is the error term. This equation answers

Research Question 2 which asks about the relationship between key demographic factors and changes in self-efficacy.

For leadership regressions, prior coding experience and prior design-thinking experience were included as two dummy variables. For coding regressions, a dummy variable capturing only prior coding experience was included. For design-thinking regressions, a dummy variable capturing only prior design-thinking experience was included. Composite scales from 32 survey items were created and analyzed. The CSE was created from 5 survey items, the DTSE scale from 12, and the LSE scale from 15. I used factor analysis to determine whether the constructs were valid. Cronbach alphas, a test of internal-consistency reliability, item-total and inter-item correlations are reported for each scale (Cronbach, 1951). Each scale was entered into both equations in the same fashion explained above. Regressions for scales and individual question responses are reported in Appendix A.

Limitations

The main limitations of this study are its small sample size and lack of control group. Generally, the methods used in this paper – regression analysis and paired t-tests – require larger samples sizes and proof of the counterfactual to make plausible claims of causality. Also, because this sample is not representative of the wider population of high school girls in Chicago and Kingston, these findings are not generalizable. Reassuringly, proving causality and making generalizable claims are not my objectives. Instead, I hope to examine the impact of a short-term intervention on the perspectives young women have of their capabilities. My aim is to determine to what extent these changes vary with race, gender, and geography.

I should also note that despite the fact that scales were created to aid this analysis, these scales are not offered as standardized psychometric constructs that should be used by future researchers to investigate design-thinking, leadership, or coding self-efficacy. These scales were created to show the impact (or lack thereof) of this particular intervention. Finally, the results presented below could be biased in a number of ways. Social desirability bias, where students exaggerate answers to give off a more positive impression to survey administrators, could affect results. This is especially likely in this study since surveys were administered by the students' facilitators. Because of this, I temper my interpretation of positive changes between pre- and post-surveys. Also, respondents who tend to agree with survey items, regardless of the context, might present inflated responses across the administered surveys. This type of response, called acquiescence responses, are difficult to guard against (Spector, 1992). Since our focus is on *change* in self-efficacy measures as opposed to *levels*, this bias might not have as great an effect on regression analysis.

Setting and Participants

BGBinc is a non-profit founded in 2015 by three women. Their mission is to empower young women to view themselves as community leaders and social entrepreneurs. They offer 6-day coding bootcamps for high school girls focused on solving meaningful community problems through technology. BGBinc targets girls from under-resourced communities in Kingston, Jamaica and Chicago, Illinois. Approximately 1/3 of the camp was reserved for girls with higher socioeconomic backgrounds. In Chicago, BGBinc recruited from a "low-income private school", a "low income CPS school", a "charter school", a "private school", and three "community programs." In Kingston, they recruited students from three high schools, Immaculate Conception

High School, Convent of Mercy Academy (also known as Alpha High School for Girls), and Holy Childhood High School.

BGB camps host up to 20 girls, five coding mentors, five design-thinking mentors, 3-4 team coaches, 2-3 story time speakers, and 1-2 public speaking experts. Each day, campers were engaged in self-efficacy exercises that encouraged them to think about their purpose in life and their visions for their futures. As mentioned in chapter 1, participants spent approximately 45 hours at camp. They had 1 hour per day to eat lunch and another hour for breaks and games. The remaining 35 hours were broken down as follows: 15 hours were spent on coding; ten hours on design-thinking; five hours on public speaking; and five hours on Purpose (confidence building and reflection). Four camps were offered during the summer of 2017 – three in Chicago, IL and one in Kingston, Jamaica. Between each camp, two lead facilitators and the author of this paper used feedback to improve the curriculum and design of the intervention. These four camps were the focus of this research study. Camp four took place in Kingston and is henceforth known as Camp Jamaica.

The intervention was designed to intentionally leverage the diverse forms of expertise participants brought to the camp so that they felt and believed in the social consequence of their work. Volunteers, particularly women with similar racial/ethnic backgrounds to youth attending the camp were recruited as mentors. Curriculum activities were included to allow youth the chance to experience mastery early on in the camp. For example, students were given relatively simple coding activities on the first day and were encouraged to do more challenging tasks as the camp proceeded. STEM professionals and civic leaders were invited to camp to share their stories with students.

Curriculum designers also paid attention to the asymmetrical power relations across participants, researchers, and facilitators. They aimed to make space for participants' endogenous design practices (informed by the participants' everyday design practices) within the crafted structure of the curriculum. The intention was to magnify the praxis (the instrumental capacity) of this design-based research project by engaging all actors, especially students, in simultaneous reflection and action upon the world to create alternate realities (Freire, 1970). Students were encouraged to create artifacts and share their thoughts through any type of medium. This is why it was important to intertwine the design-thinking, coding, and leadership modules. The curriculum development process involved daily debriefs with facilitators, ongoing analysis of field notes, and structured breaks in between camps that allowed for the creation of new or tweaking of old camp activities.

Findings

In the sections below I share background statistics that present a clearer picture of the participants attending each camp and then report results on composite scales.

Summary statistics.

The table below shows the racial distribution of camp participants, their prior exposure to coding or design-thinking training, and average age.

Table 4

Summary statistics showing race, prior exposure and age across camps

Race	Overall n	(%)	Camp 1 n	(%)	Camp 2 n	(%)	Camp 3 n	(%)	Camp 4 or Camp Jamaica N	(%)
White	6	11	4	29	0	0	2	13	0	0
Black	27	47	4	29	7	54	3	20	13	87
LatinX	10	18	5	36	1	8	4	27	0	0
Asian	7	12	1	7	3	23	3	20	0	0
Other	7	12	0	0	2	15	3	20	2	13
Prior Exposure										
No Coding	27	49	4	29	7	54	5	33	11	85
No DT	45	82	10	71	13	100	10	67	12	92
Total	57		14		13		15		15	
Age	m	(sd)	m	(sd)	m	(sd)	m	(sd)	M	(sd)
	14.5	1.7	14.9	1.5	14.9	2.0	14.5	1.2	13.8	1.8

Of the 57 participants, 47% identified as Black, 18% as LatinX, 11% as White, and 7% as Asian. Participants who identified as "other" or biracial (for example Black and Asian, White and Asian) were categorized as Other. As shown in column 4, 87% of the participants were Black and 13% were mixed (with Black). Across all camps, approximately half of the participants had no prior exposure to coding programs and 82% had no prior exposure to design-thinking. The average age for a participant in the program was 14.5.

Self-efficacy scales.

The three scales were analyzed using item-test and item-rest correlation for pre- and post-survey results. For the coding scale, item-test correlation was above 0.70 and item-rest correlation ranged between 0.48 - 0.67. These numbers indicate fairly high internal consistency. Cronbach alphas for pre- and post- coding scales were 0.79 and 0.78, respectively. Item-test

correlation for the design scale ranged between 0.42 - 0.78, while item-rest correlation had a low of 0.28 and a high of 0.73. This indicates a less reliable scale, however the Cronbach alphas (0.79 for pre and 0.87 for post) are sufficiently high. The leadership scale had item-test correlation between 0.35 – 0.86 and item-rest correlation between 0.19 - 0.82. Cronbach alphas for pre- and post- leadership scales were reassuringly high at 0.87 and 0.93. See Appendix A for the Cronbach, covariance and correlation tables.

Baseline statistics.

Overall, LSE scales were highest, followed by DTSE and then CSE. Unlike LSE and DTSE, CSE scale means at baseline were negative. This is true across race, age, and camp.

Figure 2

Baseline statistics for self-efficacy scales by race

Mean DTSE point and interval estimates by race

Mean LSE point and interval estimates by race
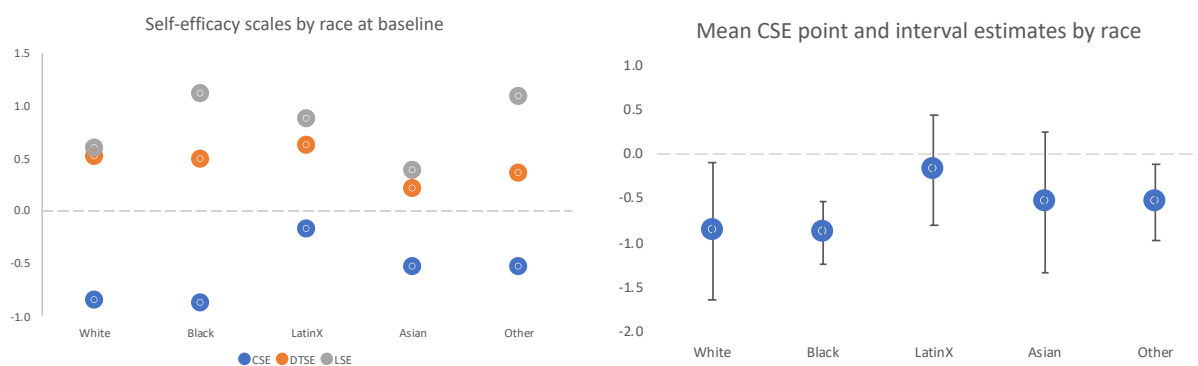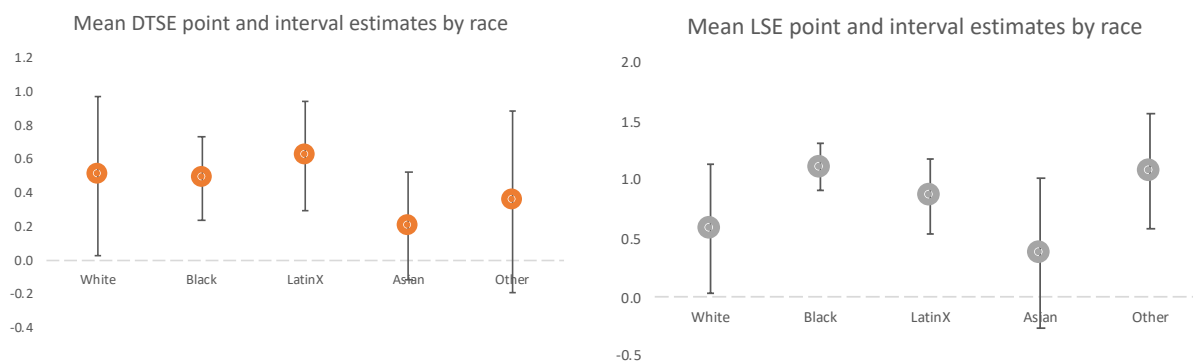
The graphs above show self-efficacy scale means for each racial category. The DTSE means showed the least variation across race, ranging from 0.20 to 0.50 within a 95% confidence interval of 0.03 to 0.97. CSE scale means showed the most variation across race, ranging between -0.89 to -0.18 within a 95% confidence interval of -1.64 to 0.45. While the first graph above shows differential self-efficacy reporting across racial categories, once the 95% confidence interval is computed, differences across race collapse. Regression analysis confirms that there is no statistically significant difference in self-efficacy reporting at the baseline by race.

Figure 3

Baseline statistics for self-efficacy scales by age
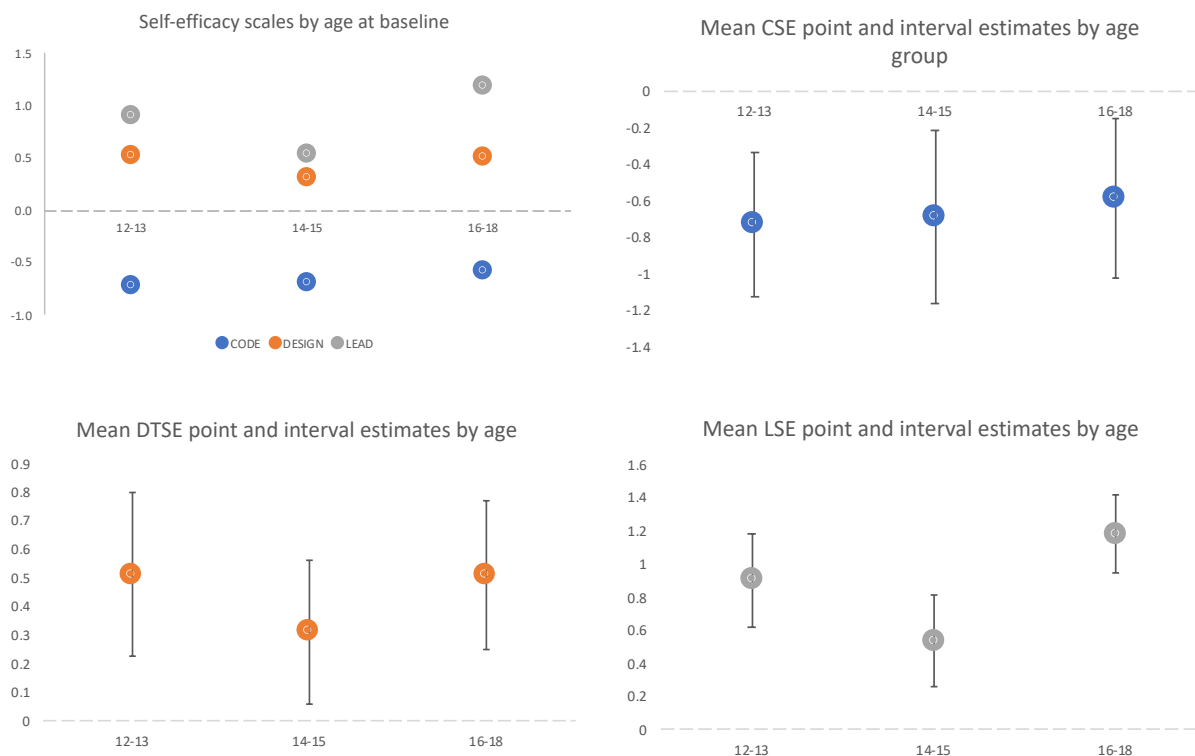
The graphs above show self-efficacy scale means for age groups. The age variable shows three categories – younger, middle, older. Younger students were aged 12-13, middle-aged were 14-15, older were aged 16-18. As seen in the graph, there were no major differences in mean estimates within the 95% confidence interval except for the difference between older and middle aged students in LSE baseline scores. Regression analysis confirms these findings.

Figure 4

Baseline statistics for self-efficacy scales by camp
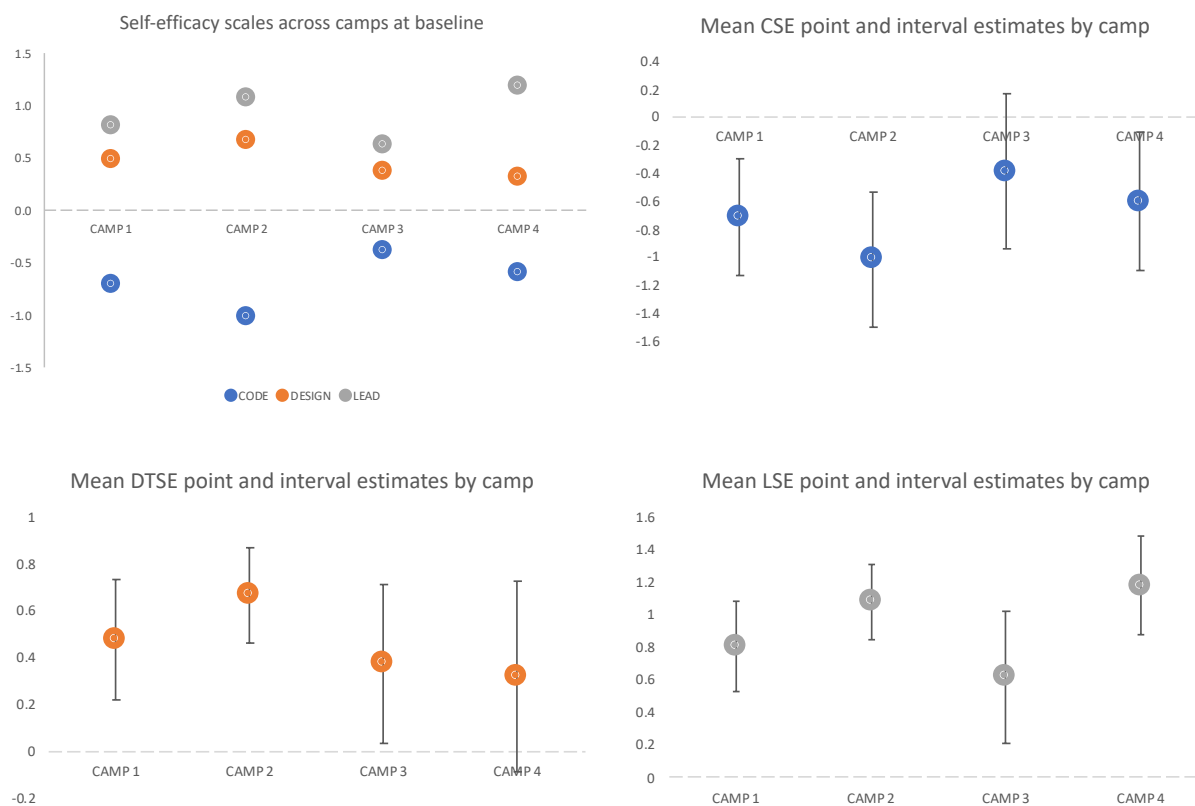
As seen in the graphs above, there was significant overlap in self-efficacy scale mean intervals for each type of scale across camps. Regression analysis confirms that there were no statistically significant differences between camps for each scale.

Change in scales.

Paired t-test results show that changes between pre- and post- surveys for each scale were statistically different from zero. As shown in the table below, changes in the coding self-efficacy

scale were the highest at 1.55 likert points. Design-thinking and leadership self-efficacy scales

increased by an average of 0.64 and 0.42 likert points respectively. The table and graph below

show the average likert score for each scale.

Table 5

Average likert score for each scale before and after the intervention

Scales	Before	After	Change
CSE	-0.60	0.95	1.55
DTSE	0.51	1.16	0.64
LSE	0.91	1.33	0.42

Figure 5
Change in self-efficacy scales over time
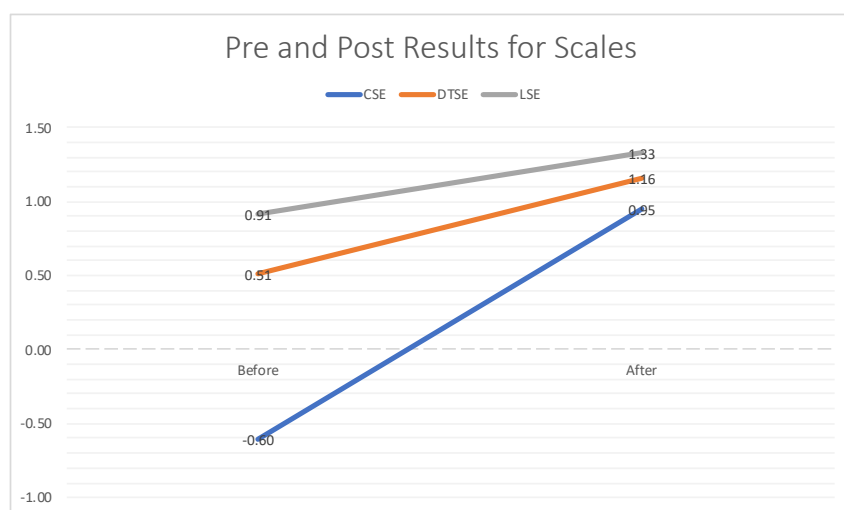
Pre-survey self-efficacy scores for coding were low with an average negative score of 0.60.

Roughly 50% of the students began the program with little to no exposure to coding and by the

end expressed a confidence level of 0.95 likert points. This is akin to responding "somewhat

agree" on the survey when asked "I am confident that I can build a website." For an intervention of 6 days, these results are plausible.

Despite the fact that only 18% of the participants indicated that they had done design-thinking prior to the camp, respondents showed a fair level of self-efficacy on the pre-survey design-thinking scale. This shows us that what we call "design" has both academic and everyday meaning. While design-thinking can be seen as a disciplinary construct, it is also constituted by practices endogenous to a variety of communities. These findings also warn us against hastily creating a psychometric construct out of a heterogeneous, multi-valanced term like design.

The relatively marginal change in design-thinking and leadership self-efficacy scales can be explained in a number of ways. It is possible that a longer time frame is needed to effect change in deep-seated beliefs and repertoires of practice. While the design-thinking curriculum touches on mindset change and youth political socialization, the more durable and stable identities that motivate behavior and interaction are not likely to be affected within such a limited time frame. On the other hand, CSE, while presented here as a psychological construct, has a large technical component as well. It is possible that the cognitive schemata created for learning new technical concepts (like how to change the font color) could be more easily manipulated than new mindsets or systems of interaction that have already been culturally programmed. Another interpretation is the role that immersive mastery experiences play in self-efficacy development (Bandura, 2006). The curriculum provided more opportunities for students to test out coding skills, master them, and then move on to more advanced techniques. It is possible that these mastery experiences were a mechanism for differential effects on efficacy

types.[4] Another very likely reason is that baseline statistics for coding self-efficacy were much

lower than that of DTSE and LSE. Thus, CSE had more room to grow.

Regressions that examined the relationship between demographic covariates and changes

in the coding scale revealed that prior coding had a negative and statistically significant impact

on change in coding. More specifically, those who had prior exposure to coding reported lower

likert scores by 0.62 (p-value .04), on average. This is statistically significant at the 5% level.

See the table below:

Table 6

Change in self-efficacy scale regressions with co-variates

	CSE Change	DTSE Change	LSE Change
Age	-0.064	0.098**	0.013
	(0.086)	(0.046)	(0.042)
White	0.559	-0.102	-0.089
	(0.445)	(0.237)	(0.216)
LatinX	-0.170	0.020	0.272
	(0.384)	(0.207)	(0.187)
Asian	-0.355	-0.010	0.032
	(0.388)	(0.208)	(0.188)
Other	0.264	0.178	-0.091
	(0.404)	(0.218)	(0.196)
Camp 1	-0.219	0.033	-0.030
	(0.381)	(0.209)	(0.188)
Camp 3	-0.626*	-0.058	0.047
	(0.353)	(0.198)	(0.178)
Camp 4	-0.785*	0.332	0.070

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[4] In earlier iterations, mastery experiences were included in the design-thinking modules. For example, students were asked to do the Wallet Exercise, an activity developed by the Stanford d.school to give students a taste of the entire design-thinking process in just 90 minutes. The activity was removed because students needed between 2-2.5 hours to complete the activity and this was cutting into the time students needed to reflect on and choose the social issues they wanted to devote the rest of the week to solving. Defining mastery experiences for the design-thinking and leadership modules for a short 6-day intervention remains a challenge.

	(0.426)	(0.220)	(0.211)
Prior Coding	-0.619**		-0.044
	(0.289)		(0.146)
Prior DT		-0.008	-0.202
		(0.172)	(0.161)
Constant	3.168**	-0.832	0.277
	(1.325)	(0.686)	(0.656)
Observations	47	47	47
R-squared	0.232	0.217	0.148

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

There also seemed to be some variation across camps. In comparison to Camp 2, Camp 3 and Camp Jamaica reported lower scores by 0.63 (p-value 0.08) and 0.79 (p-value 0.07) likert points in CSE. However, these differences were only significant at the 10% significance level. For DTSE and LSE, no statistically significant differences between camps were recorded. Camp Jamaica was the last of the camps to take place. As a result, the curriculum offered to the Jamaican students had been tried and tested three times before. Thus, it is strange that major differences are not seen between Camp Jamaica and those hosted in Chicago. Age had a statistically significant effect on DTSE scale change. On average, a student one year older would report higher changes in the DTSE scale by 0.098 (p-value 0.04) likert points. While this change is slight, it is significant at the 5% level. None of the covariates had a statistically significant impact on LSE scale change. Furthermore, race was not statistically significant for any of the scales. The scale change regression tables are included in Appendix A.

Race and age don't matter?

As mentioned above, baseline levels for all three self-efficacy scales were not statistically

different across age or race. Generally speaking, race and age do not drive change in self-

efficacy scores. At the 5% significance level, the only exception was that older students reported

higher changes on the design-thinking self-efficacy scale by 0.098 likert points. It was not

possible to assess the interaction of age and race because the small size of this sample. Many of

the race-age categories had only 1 or 2 participants. Socio-economic status is likely a stronger

predictor of change in self-efficacy. Unfortunately, information on parent education, parent

income, or parent occupation was not collected.

To more deeply examine the impact of age on self-efficacy scale change, I used the age

groups mentioned in baseline statistics – younger, middle, and older – in a regression with co-

variate controls. Controls included race, camp, and prior training. Similar to findings presented

above, age was a statistically significant covariate only for changes in the DTSE scale. However,

in this case we have additional information on differences across age groups. Older students

reported higher changes in DTSE than younger students (0.39 likert points, p-value 0.02). See

the table below.

Table 7

Change in self-efficacy scale regressions with age groups

	CSE Change	DTSE Change	LSE Change
Middle age group	-0.159	-0.014	-0.022
	(0.320)	(0.163)	(0.153)
Older age group	-0.217	0.394**	0.030
	(0.317)	(0.164)	(0.155)
Race	-0.059	0.038	0.015

	(0.109)	(0.055)	(0.052)
Camp	-0.204	0.073	0.003
	(0.127)	(0.063)	(0.061)
Prior Coding	-0.541*		-0.079
	(0.270)		(0.138)
Prior DT		-0.098	-0.153
		(0.156)	(0.156)
Constant	2.540***	0.300	0.482**
	(0.465)	(0.199)	(0.223)
Obs	47	47	47
R^2	0.124	0.196	0.057

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

There was no statistically significant difference between younger and middle-aged students. These findings support the idea that there are developmental pre-requisites for engaging with socio-political subject matter on a meaningful level. Many of the design-thinking survey questions were connected to activities in which students discussed topics related to racial politics and their positionality. On the other hand, changes in coding and leadership self-efficacy are likely more sensitive to initial self-efficacy levels as opposed to high school age. Analysis of initial level of self-efficacy is presented below.

Does initial level of self-efficacy matter?

One might expect that a student with low reported self-efficacy might report a greater change due to the intervention than a student who enters already confident and self-assured. Similarly, students with the highest levels of self-efficacy would have had little more self-efficacy to develop over time. On the other hand, it could be true that students with the lowest levels of self-

efficacy might not respond to the intervention, perhaps because of ineffectual dosage. For example, these students might need one-on-one support or a longer program. In this case, students with higher prior self-efficacy scores might report greater change due to the intervention. To determine to what extent prior self-efficacy affects changes in coding, design-thinking, and leadership self-efficacy scales I used the following regression.

Table 8

Change in self-efficacy scale regressions with initial self-efficacy quartiles

	CSE Change	DTSE Change	LSE Change
QRT1	1.344***	0.475**	0.431***
	(0.257)	(0.191)	(0.140)
QRT2	1.433***	0.227	0.629***
	(0.299)	(0.185)	(0.148)
QRT3	0.179	0.209	0.495***
	(0.264)	(0.188)	(0.173)
Race	-0.013	-0.003	0.005
	(0.081)	(0.055)	(0.043)
Age	0.016	0.105**	0.024
	(0.065)	(0.044)	(0.035)
Camp	0.096	0.098	0.032
	(0.104)	(0.063)	(0.052)
Prior DT		0.066	-0.086
		(0.162)	(0.149)
Prior Coding	-0.204		-0.226*
	(0.198)		(0.118)
Constant	0.498	-1.344*	-0.251
	(1.138)	(0.691)	(0.573)
Observations	47	47	47
R-squared	0.576	0.254	0.383

Standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

The table above shows that for design-thinking, students beginning the program with DTSE scores in the lowest quartile (QRT1) reported the greatest changes. In comparison to students who entered the program with the highest self-efficacy scores (QRT4), youth in the QRT1 reported a higher average change in design-thinking efficacy by 0.48 (p-value 0.02) likert points. Students beginning the program with CSE scores in the second lowest quartile (QRT2) reported the greatest changes. In comparison to QRT4 students, QRT2, and QTR1 students reported a higher average change by 1.43 (p-value 0.00) and 1.34 (p-value 0.00) likert points respectively. Similar patterns were seen in LSE scores. Students who started the program with LSE scores in QRT2 reported highest changes. Improvements to LSE scores for QRT2, QRT3, QRT1 were 0.63, 0.50 and 0.43 respectively (all significant at the 1% level). Overall, students starting in QRT4 showed the lowest changes in self-efficacy scores across all three scales. This shows the ceiling effect that these types of programs have on changes in self-efficacy. In other words, if a student is already confident in her ability to code, design, and lead, this intervention has a relatively minimal effect.

Discussion and Conclusion

This study examined changes in design-thinking, leadership, and coding self-efficacy of 47 high school girls attending a 6-day civics coding camp in Chicago, Illinois and Kingston, Jamaica. Results showed that CSE improved the most for all 4 camps. Approximately 50% of the students began the program with no exposure to coding. Students with prior exposure to coding reported lower changes in CSE. This curriculum could have complicated what students knew about coding because of the ways in which coding was intertwined with the design-thinking and leadership modules. Thus, students with some knowledge of coding might be wrestling with the

integration of new coding concepts within existing cognitive structures. More than learning where to open and close html tags, coding can be seen as a fluid language that articulates a work in progress – a platform that scopes and deconstructs complex inequitable systems. LSE and DTSE scales increased only slightly over time.

On the one hand, this study is quite clearly about program evaluation – to what extent to did this program have the effect it intended and why did it (not) work? I have shown that generally speaking, students left the camp with an improved sense of capability across the three categories. It is quite possible to introduce high school students to coding and have them develop a website in a week. However, it is far more difficult to engage students in discussion about civics and politics in ways that deepen their understanding of the structures that prop up and propagate inequality and oppression. Praxis, as Freire explains, requires the simultaneous reflection upon and action on the world in order to change it (Freire, 1970). BGBinc may have successfully taught how to act (code) but may not have sufficiently executed praxis (to code AND reflect through design-thinking).

On the other hand, this work contributes to self-efficacy theory by showing what is and what is not possible in a short-term intervention. LSE, particularly leadership that is a "purposeful, collaborative, values-based process that results in positive social change" in today's political climate might need to account for the frustration youth encounter when building alliances across differences (Komives & Wagner, 2016, p.xii). The socio-political subject matter explored in these modules were complex, ill-structured conundrums with no simple answer. Students engaged in these types of conversations navigated the personal and the political, making room for other participants' views while holding on to values that defined them. The precarity and fragility of holding the self and another in respectful conversation, of "conversing with

civility" is intellectual *and* emotional labor. "Controversy with Civility" a key construct of the SRLS, should make space for initial reductions in leadership self-efficacy as students *grow through controversy*. Restraint is a muscle developed over time and respect must be earned. It is possible that this added intellectual and emotional labor partly explains marginal changes in LSE.

While self-efficacy has been rigorously explored in the educational psychology field, the data presented here shows us a case of something beyond task-related capability. If the language of positionality is layered on top of self-efficacy theory, we might have something to say about the conditions that enable self-efficacy to nurture critical consciousness. One's perception of one's ability to effect change in the world is related to one's position vis-à-vis the economic, political, and social structures in that world. Similarly, critical consciousness is an awareness steeped in an understanding of positionality, power, agency, and structure (Freire, 1970). Developing self-efficacy in interdisciplinary contexts that merge technical know-how with politically personal (or personally political) issues encourages the pursuit of knowledge with a purpose. An increase in self-efficacy in a context where civic and coding are seen as mutually supportive could deepen critical consciousness which "shapes new activity, which shapes reality ... which again, in turn, shapes consciousness," (Moje & Luke, 2009, p. 425). Shifts in self-efficacy are just a beginning.

Study 3

"We Label Each Other Uptown or Downtown":

Jamaican and American Youth Explain Inequality

Introduction

Rising inequality is the "defining challenge of our time" (Obama, 2013). In 2018, income inequality was the highest it has ever been recorded by the US Census Bureau (Semega, Kollar, Creamer & Abinash, 2018). According to the 2018 World Inequality Report (WIR), since 1980, America has seen extreme divergence in income shares between the very wealthy and the poor. The top 1% of income earners represented 10% of national income in 1980 and 20% in 2016. Meanwhile, the bottom 50% of income earners held 20% of national income in 1980 and 13% in 2016 (Alvaredo, Chancel, Piketty, Saez & Zucman, 2018). Beyond America, inequality has deepened the chasm between the haves and the have nots. Since the Great Recession of 2008, the world's billionaires have increased their wealth by 900bn just in the past year, while the wealth of the poorer 50% of the world decreased by 11% (Oxfam, 2019, p. 10). These magnified inequalities have catalyzed protests across the world, from the Arab Spring in Tahrir Square to Occupy Wall Street (Herterl & Schöneck, 2019). In Jamaica, inequality, particularly along ethno-racial lines, is deeply felt. However, while the majority of the population accepts that color-based hierarchy structures economic opportunity and poverty in Jamaica, many still embrace a nationalist identity of ethnic oneness. This nationalist identity promotes a color-blind ideology that conflates racial discrimination with classism (Kelley & Bailey, 2018). In other words, the racialized structure of poverty – whereby Jamaicans of African descent make up the majority of

the poor and uneducated, whereas the majority of White Jamaicans are well-educated in the middle-to-upper income strata – is largely overlooked. Within the Latin American and Caribbean region, Jamaica ranks 22nd out of 25 in the Commitment to Reducing Inequality (CRI) Index, a measure created by Oxfam International to measure the extent to which governments enact policy to reduce social and economic inequalities. In comparison to the US, Jamaica is ranked 96th out of 157 countries while America is ranked 23rd (Oxfam, 2018).

While these statistics paint a stark reality, adults grossly underestimate income inequality in America. In a nationally representative study of 5,522 respondents, Norton and Ariely (2011) discovered that participants believed that the wealthiest 20% of the population controlled 59% of America's wealth when the true amount was approximately 84% at the time (p. 10). But what about the youth perspective? And what about the perspective of youth living outside of the United States? How do they understand and characterize inequality? Studies have shown that people's beliefs about the causes of inequality impact the types of social policy they deem appropriate to alleviate inequality (Hunt, 2016). People who believe that inequality and concomitant poverty is caused by people's lack of motivation to improve their station are less likely to support welfare policies (Gilens, 1999). Beliefs about inequality affect how people vote, which social movements they support, and affects the public's acceptance of the welfare state (Hunt, 2004). It is thus important to understand how people, and youth in particular, think about inequality.

In this paper I ask, what theories do American/Jamaican youth articulate to explain inequality in the US/Jamaica? I analyze surveys administered to 49 students who attended a civics coding camp in the summer of 2017. Three camps took place in Chicago, Illinois and 1 in

Kingston, Jamaica. I argue that students' theorizations of inequality are nuanced, complex, and differ qualitatively from adult public opinion. Unlike adults, youth in this sample who believe that peoples' actions cause inequality blame discriminatory and prejudicial action towards others as opposed to a person's lack of talent or will. As such, the focus on individual action does not obscure power-laden structures that hold minoritized groups back. While these youth highlight "people's beliefs" and "people's mindset" they also attend to the structural conditions that manifest in an inequitable opportunity structure (Ireland, 2018). Jamaican and Black American youth expressed similar types of theories but drew on different contextual examples to explain their beliefs. For example, Jamaican youth foregrounded classism when theorizing inequality while Black Americans foregrounded racism and present-day segregation. This study offers a qualitative analysis of understudied youth groups (Asian American and Caribbean) to the literature on people's beliefs about inequality. I begin with a summary of the literature on adults' beliefs about inequality and then discuss adolescents' beliefs. In the sections that follow I discuss the context of the study, analytical procedures, and report findings. In the final section, I reflect on the importance of helping youth develop a critical awareness of sociopolitical subject matter.

Adult Beliefs About Inequality

In Sociology, the stratification beliefs literature studies people's beliefs about inequality and poverty by examining population-representative public opinion polls. In the stratification beliefs literature, public opinion on inequality is largely of two types - individualist or structuralist (Feagin, 1972; Kluegal & Smith, 1986; Hunt, 2016). Individualist beliefs attribute inequality to the poor's lack of talent or motivation and the wealthy's inherent skill or entrepreneurial spirit (Hunt, 2007). On the other hand, structuralist beliefs reflect systems-level

or societal reasons to explain inequality, for example inequitable opportunity structures, the

macroeconomic climate, unemployment or inequitable access to quality education (Lepianka et

al., 2009). Studies investigating the impact of race, socioeconomic status (SES), and gender on

stratification beliefs have found major differences across social groups. Generally, women tend

to be more structuralist than men (Flanagan et al., 2014; Bullock, 2006). Race, and not socio-

economic status, is a stronger predictor of inequality beliefs (Hunt 1996; Kleugal & Smith, 1986;

Hunt 2004). Black and Latinx Americans choose more structuralist responses than White

Americans but all three groups offer similar levels of individualist responses (Feagin, 1972; Hunt

1996, Hunt 2007). According to Hunt (1996) Latinx Americans rank highest on individualism,

followed by Black and then White Americans (p. 301). Up until Hughes & Tuch (1999), Asian

Americans had not been included in the seminal studies on stratification beliefs. In their study,

Asian American respondents were most similar to their Latinx participants who were highly

likely to attribute individualist causes to explain the prevalence of poverty in other racial groups.

The high proportion of both individualist and structuralist beliefs for minoritized groups is seen

by some scholars as evidence of a split consciousness (Hughes & Tuch, 1999), dual

consciousness[5] (Bullock, 2006), or simply, compound beliefs (Lepianka, 2009). As cited by Hunt

(2016), Kleugel & Smith (1986) believe that this pattern in public opinion reveals a "hegemonic,

dominant ideology of individualism [that] affects the thinking of all Americans, while adherence

to structuralism and other system-challenging, ideological alternatives is more variable,

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[5] This theory is connected to the W.E.B Dubois' argument that African Americans experience a double consciousness as they grapple with "two souls, two thoughts, two unreconciled strivings," (DuBois, 1903, p.3). They must balance their life within the dominant culture with their vision of who they are as black people. This double consciousness is reflected in stratification beliefs in a particular way (Bobo, 1991). According to Hunt (1996) "blacks demonstrate the strongest group consciousness in their support of structural challenges to the dominant ideology but stop short of denying the injustice of economic inequality in principle and of dismissing the idea that the rich and the poor as individuals are deserving of their fate, " (p. 303).

dependent on group-based and personal experiences, and layered onto an individualist base"
(Hunt, 2016, p. 395). This system-challenging perspective is more cognitively and emotionally
demanding as the status quo is easier to defend and uphold (Jost, Federico, & Napier, 2009 as
cited in Flanagan 2014).

Beliefs about inequality influence political behaviors (such as voting, participation in
social movements) and public appetite for social policy (Hunt, 2016; Kuziemko, Norton, Saez &
Stancheva, 2015). Studies have found that racial differences in stratification beliefs result in
racialized difference in public support for policies that redress inequalities, particularly welfare
and redistributive taxation (Hunt, 2004). Generally speaking, those who cling to individualist
causes oppose redistributive policy (Bobo, 1991) and affirmative action type policy (Kleugal,
1990; Krysan, 2000). Given the correlation between types of stratification beliefs and racialized
social policy, in the midst of rising inequality and racially charged political polarization, studies
that expand our understanding of how groups of people theorize inequality are important.

The majority of the stratification beliefs literature explores theories of inequality
espoused by White-, Latinx-, and African-Americans. This existing sample of social groups
needs to be expanded to include non-American populations, non-European populations, and
Asian American sub-populations (for example Japanese-Americans and Chinese-Americans) for
more robust theorizing. This is because each social group has a unique historical experience with
inequality and each social group has particular experiences with regressive social policies and
forms of discrimination. For example, second and third generation Asian Americans whose
families faced horrors like Japanese internment during World War II or anti-Chinese sentiment
and mass deportation (stemming from White American fear of Chinese communism in the
1950s) (Saito, 1997; Johnson, 1997) will have a particular historical characterization of the

causes of inequality. Similarly, Jamaicans will have a different world view. Unlike racial

minority groups in the United States, Jamaicans of African descent represent the majority in

Jamaica. Having won political independence just 58 years ago, Jamaicans grapple with a long

history of colonization. In 1962, Jamaica's motto Out Of Many One People – insisted on national

acceptance of one national identity – we are all Jamaican. As such, Jamaicans' (of African

descent and otherwise) perception of inequality is likely to be filtered through color-blind

ideology (Kelly & Bailey, 2018). Communal experiences like these shape each social groups'

awareness and articulation of inequality. In order to strengthen the conceptual foundation of

stratification beliefs, theories need to include a wider variety of social groups in order to account

for differential historic experiences with oppression and colonization.

Research on youth's understanding of inequality

Research on youth's understanding of inequality has not received as much attention in the

literature on youth civic engagement and stratification beliefs. For the Learning Sciences, this

type of research is important because youth's understanding of inequality reflects their

understanding of their positionality, power and its distribution. Youth's understanding of their

world and their position in it plays an important role in how they challenge and/or uphold

structural conditions (Mendenhall & Wooyonng, 2019). In this section, I summarize some of the

studies that have been conducted and focus on Payne and Furnham's (1985) study on 503 youth

in Barbados and Dominica, the only study I could find on Caribbean youth's stratification

beliefs. Studies on youth beliefs have addressed a developmental question – how does age vary

with youth's ability to attribute inequality to structuralist factors? (Halik & Webley, 2011;

Harrah & Friedman, 1990; Flanagan et al., 2014). They find that older children are more likely to

point out factors like job loss and homelessness when discussing poverty (Brown, 2007). By contrast, younger children highlight individual effort when explaining why people are wealthy (Leahy, 1981; Flanagan et al., 2014). Studies have also examined the degree to which SES covaries with belief types. Results show that youth from higher socioeconomic groups employ more individualist factors to explain inequality (Chafel, 1997; Flanagan & Tucker, 1999). Other studies have found the opposite. For example, Crosby & Mistry (2004) show that students with lower SES are more likely to blame the poor for their misfortune (as cited in Flanagan et al., 2014). In an effort to explain the mechanisms through which SES affects stratification beliefs, Flanagan et. al (2014) found that students with higher SES backgrounds had a deeper understanding of the structural causes of inequality if their parents were educated and if their families and classmates discussed current events.

In more a more context-focused study, Brown et al. (2007) found that youth believed that the government should have played a more active role in mitigating the humanitarian crisis that followed Hurricane Katrina by providing employment, shelter, and funds. In the Caribbean, Payne and Furnham (1985) found that students from Barbados and Dominica rated structuralist explanations higher than individualist explanations when asked about poverty and inequality in their respective countries. The structuralist responses highlighted the failure of the private sector to provide jobs and pay a decent wage. Context had a significant impact on students' beliefs. Contrary to their hypothesis, Barbadian youth were more likely to recognize inequality and injustice than Dominicans, whose country is less developed. Payne and Furnham (1985) hypothesized that Barbados had a more active media that brought the public's attention to social and political inequalities. They also suggested that inequality in Barbados was more visible as tourists and "luxury hotels flourish next to tiny wooden chattel houses [and] petty traders try to

sell a few vegetables outside department stores full of fine porcelain and video machines," (p.225). Barbadian youth also benefitted from a more developed education system and exposure to a range of socioeconomic issues as Barbados has a diversified economy while Dominica is largely agricultural.

Setting and Participants

As mentioned in studies one and two of this dissertation, BGBinc is a non-profit that runs 6-day civics coding camps for high school girls in Chicago, Illinois and Kingston, Jamaica. They target girls from underserved communities, reserving ⅓ of the space for students from more affluent families. Recruitment strategies focused on connecting with high schools that predominantly served "low income" students. In Chicago, BGBinc partnered with a "low income private school," a "low income CPS school," a "charter school," a "private school," and three "community programs." In Jamaica, they partnered with three high schools and asked teachers to identify students in their first or second year of school who might benefit from the program. Jamaican students typically begin high school at age 12.

The curriculum offered three modules - design-thinking, leadership, and coding (specifically HTML, CSS, and Javascript). Students were engaged in a design-thinking process that encouraged them to think about social inequalities and develop a technology platform to alleviate a social problem. BGBinc offered four camps - three in Chicago, IL and one in Kingston, Jamaica to roughly 12 students per camp. The majority of participants identified as Black (47%). 18% identified as LatinX, 11% as White, and 7% as Asian. 22% of the respondents were Jamaican. Students were 12-17 years old.

Data and Analytical Procedures

I administered pre- and post-surveys to 49 camp participants during the summer of 2017. These surveys included open-ended questions and self-efficacy questions rated on a 5-point likert scale. In study 2, I conducted a quantitative analysis of the likert-rated self-efficacy questions. In this chapter, I delved into the open-ended questions that asked camp participants "do you think there is inequality in the US/Jamaica? If so, why does it exist? If not, please explain your view."

I use the codification of stratification beliefs in the literature as a conceptual and analytical tool to examine the ways in which students theorized inequality. By using open coded surveys, I departed from the methods commonly employed in the literature. Large scale studies that use population-representative samples to examine the public's beliefs about inequality more often than not, used forced-answer surveys that prompted respondents to choose particular statements coded as a type of stratification belief. But with these forced answers, the ambiguity, complexity, and nuance in human thought is all but erased (Lepianka et al., 2009). In surveys with open-ended questions, students may offer their own theorizations without prompting or typecasting.

At the same time, when respondents are free to openly share their perspectives on a matter, open-ended survey responses can be unclear or incomplete. This is especially true when interviewers are not present to clarify participants' questions (Denscombe, 2008). There is also a much greater risk of item non-response when respondents skip the question altogether (Reja, Manfreda, Hlebec & Vehovar, 2003). For this study, camp coaches were present to offer clarification and answer questions. Respondents were encouraged to complete all the questions to the best of their abilities.

In this survey, youth were provided an opportunity to articulate their view about inequality – a complex sociopolitical phenomenon with myriad causal attributions. I originally intended to assess the impact of the intervention in shifting students' beliefs, but the post-survey responses were much shorter. The average response across pre- and post-surveys was 90 words. On average students wrote 121 words per prompt in the pre-survey. In the post-survey, the answers dropped to 54 words on average. One of the major limitations affecting this study is the difference in quality of answers given in the pre- and post-surveys. Students likely experienced fatigue after a long week of programming. They probably did not see the value in answering the same question they had put so much effort into before the camp started or did not feel the need to "impress" or exert effort now that the camp had ended. Still, the answers are analyzed to reveal the range of responses students had about the causes of inequality.

I completed two rounds of coding. The first cycle of coding was deductive. I looked for individualist and structuralist phrases throughout the sample. As mentioned in the literature review above, individualist codes refer to personal action or ability as causing inequality and structuralist codes refer to systems-level or societal causes of inequality. In the second cycle of coding, I employed inductive methods to codify the types of individualist and structuralist beliefs emerging through analysis (Miles, Huberman, & Saldana, 2014). For example, structuralist-historical and structuralist-political became sub-codes during the second cycle of coding. Responses that had a combination of structuralist and individualist codes were labelled compound. Examples of codes are included in Appendix B.

Findings

In the sections below, I argue that students in this sample have a nuanced and complex

understanding of inequality. Secondly, I claim that Jamaican respondents tend to equivocate or

question the existence of inequality more than their American counterparts.

Nuanced and complex theorizations of inequality.

Table 9 below shows examples of pure individualist, pure structuralist and compound

stratification beliefs produced in this sample.

Table 9

Sample representative statements for stratification beliefs

Pure Individualist	Pure Structuralist	Compound
I believe that there is inequality in the US because of people maintaining closed minds and not being willing to accept change… White American, age 16	During the 1800s black people weren't allowed to learn read or write. They were considered animals, like dogs. Then after slavery there was segregation… but even now Chicago is separated … No matter what people may say. We're split up. Because it's always been that way. But that way isn't right. Black American, age 13	I think it exist because some ethnicity's think some are better than the others. There is also an inequality in the United States because of where people come from for example the middle class, upper class, and the lower class. Black American, age 15

I think there is inequality in the US because of the way our human nature is. Our human nature is that of wanting to be the best. Being the best makes people selfish for themselves. They don't want to share what they have and they keep what they have to themselves Asian American, age 14	The reason why these types of inequalities exist is due to the traditional individuals/values that have been so deeply rooted in the American belief system, one that constantly counteracts any change in the makeup of their society. In light of recent events, these traditional values championed as President Donald Trump won the 2016 Presidential Election, bringing with it the islamophobia and xenophobia." Asian American, age 16	I think there is inequality in the US and it exist because of the unjust people in the United states and the unjust law... There is always someone who is bias towards someone else creating inequality. Secondly, there is inequality in the US because of the unjust law system. For example, [some] people are unjustly put in prison for a longer amount of time just because of slight difference being, creed, class, or color." Black American, age 13
Yes, I do think there is inequality because everybody is treated differently some good, some bad … Jamaicans label each other as "up-town" people or "down-town" people." Black Jamaican, age 12	"I don't think that there is a lot of inequality cases, however I do think that there is widespread classism with some cases of gender inequality in Jamaica. Black Jamaican, age 16	In Jamaica persons are treated different based on their financial status. Persons also look at you different based on how you dress, how you talk , who you associate with and the community you live in. Some schools are expensive so its hard for a less fortunate person to get in these schools so even when you are mentally qualified for the school there not physically qualified Black Jamaican, age 12

The nature of individualist beliefs.

Overall, this sample had 31 individualist responses (including those counted in compound

responses) and 13 pure individualist responses. Pure individualist explanations for the causes of

inequality highlighted "people's beliefs[6]", "human nature", people's "mindset", or how people

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[6] People's beliefs (or more precisely personal beliefs) that imply or refer to an individual's perception or theory of the world and other people, were coded individualist. These personal beliefs affect how one person treats another

"treat" one another. Students who advanced individualist reasons for inequality also shared

personal stories about witnessing racism in their communities. For example, one student (White

American, age 16) explained, "I believe there is inequality in the US because people maintain

closed minds. I live in a town where I see the confederate flag at least once a month…We

believe that people are SO different that they are unable to connect on any front instead of

finding common themes or interests." Of the 31 people who offered individualist beliefs

(whether pure or compound), 3 had a personal affect. One student (Asian American, age 14) said

"inequality exists because of people." She explained that "human nature makes people selfish

and not want to share." This type of response has a fatalistic sentiment. It calls to attention the

role that people play in propagating inequality but concedes that it is in our nature to do so.

Another student (Latinx American, age 16) explained,

> The one's that have more power would always been at the top while the one's who have
> less power would be at the bottom. The views of those who are powerful affect how
> others are treated. People like Paolo Freire have tried to help the oppressed come out of
> that state but to no avail. He was seen as a bad guy towards the government.

In the comment above the student alludes to power and positionality. She labels Paolo Freire, a

well-known Brazilian scholar and activist dedicated to upending oppressive power structures, an

enemy of the state incapable of having an effect. To her, Paolo Freire was not a powerful person,

and it is through powerful people that change is made possible. This statement was coded as

individualist because she highlights the role that "superior" and "inferior" people's "*views*" play

in reproducing inequality. This is similar to the "mindset" and "beliefs" that other students have

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person. Beliefs that imply or refer to societal norms or group-level bias (that often leads to discrimination or
differential treatment across social groups), were coded as structuralist.

offered as causes of inequality. However, by alluding to the role that power plays, the student

gestures toward more structuralist attributions but does not explicitly name them.

Only one Jamaican student offered a pure individualist response. She (Black Jamaican,

age 12) explained, "Yes I do think there is inequality because everybody is treated differently

some good, some bad … Jamaicans label each other as "up-town" people or "down-town"

people." In her comment she offers more context,

> They might say someone is "Up-town" because they might look rich or because they live
> in a rich area or drive fancy cars or even the way they speak but is that really the
> definition of rich? They label "down-town people as the poor people because of the way
> they look, talk and their lifestyle but most "down-town" people do extremely well this
> simply means everybody is equal and should be treated with same amount of respect as
> nobody is more special than anybody else.

This student is expressing her frustration with classism in Jamaica. Indeed, in Jamaica,

classicism (and not racism) is the more pronounced differentiator between groups of people. This

comment is an example of an individualist response that attributes inequality to people's

(differential) treatment of one another.

The nature of structuralist beliefs.

Overall, this sample had 38 structuralist responses (including the structuralist responses

counted in compound responses) and 17 pure structuralist responses. Pure structuralist

explanations for the causes of inequality highlighted historical and political dimensions of

inequality. Students talked about history, namely slavery in the US or Jamaica, and its impact on

present-day segregation, inequitable access to opportunities, and stereotypes. For example, one

student (White American, age 14) said, "when the Americans finally saw how unjustly the slaves

were being treated they finally revolted resulting in the civil war. After the slaves were liberated

and set free they never truly had the same rights as the white Americans." This student then

described segregation in Chicago where the Hispanics live in Logan Square and Whites live in

the north suburbs. A similar comment was made by a Black American (age 13) student. She said,

> During the 1800s black people weren't allowed to learn to read or write. They were considered animals, like dogs. Then after slavery there was segregation… but even now Chicago is separated … No matter what people may say. We're split up. Because it's always been that way. But that way isn't right

Of the 38 people who offered structuralist beliefs (whether pure or compound), 13 referred

explicitly to historical causes and these historical causes were always linked to present-day

issues. As such, inequality and all the -isms associated with it (racism, sexism etc.) were not

relegated to the past, as critical theorists and social justice advocates caution against (Philip &

Azevedo, 2017).

Students who commented on politics talked about American President, Donald Trump.

An Asian American student (age 16) explained,

> The reason why these types of inequalities exist is due to the traditional individuals/values that have been so deeply rooted in the American belief system, one that constantly counteracts any change in the makeup of their society. In light of recent events, these traditional values championed as President Donald Trump won the 2016 Presidential Election, bringing with it the islamophobia and xenophobia.

Another student, (Black American, age 15) said, "White supremacy is also another huge part of

inequality; almost anyone in America can probably tell you that… The American President is a

very good example of inequality in the US. His foreign policies are not equal at all." In these

statements, politics is framed as an amplifier of discrimination. In the former statement, the

American belief system is the root of inequality. These racist anti-immigrant traditional values

are "championed" by President Trump. In the latter statement, the student frames "foreign

policy" as an instrument of inequality. Of the 38 people who offered structuralist responses, 4 were political.

Other types of structuralist responses described present-day discrimination. For example, a White American student (age 13) spoke about differential conviction rates for Black people. She said, "a study has shown that 95% of the people asked viewed a drug user and seller as black. Those 95% of people make up our juries and their biases can cause people to go to jail for much longer than usual." She then discussed the difficulties poor families face in raising money to hire a good attorney and explained that "24% of black people living in America are in poverty." She provided a list of other examples of inequality

> Unequal pay, white men getting off charges while all the evidence is against them, fatphobia, the fact that texas wants to have a law that adoption groups can refuse right to: gay couples, interracial couples, jewish, muslim couples, the fact that segregation and slavery are still around just by new names.

Another student (Black, age 17) explained that people racially profile others. "When white police officers racially profile young African American men and women because they see those young teens as inferior to them as older white educated males with power." She then gave an example of gender discrimination, "women are seen as weak, fragile, and care-takers in the eyes of society. This is inequality because women should be seen as equals to men." Another student (Black, age 14) said that "racial issues ... bring out a certain type of rage" that then turns into "violence we witness on the news … or in person" and that leads to "police brutality." She then talked about Donald Trump who she described as "careless and all he wanted to do was prove that he can be the president."

The Jamaican students who offered structuralist responses to the question of inequality spoke about classicism (a particular type of discrimination) in 67% of the structuralist (pure or

compound) responses. In some cases, students explicitly called out classism. For example, a Black Jamaican student (age 16) said, "I don't think that there is a lot of inequality cases, however I do think that there is widespread classism with some cases of gender inequality in Jamaica," In most cases, students referred to differences in culture or socio-economic status. For example, a Black Jamaican student (age 12) said, "In Jamaica persons are treated different based on their financial status. Persons also look at you different based on how you dress, how you talk, who you associate with and the community you live in."

The nature of compound beliefs.

Overall, this sample had 18 compound responses. Compound responses connected people's beliefs (individualist) with group level bias (structuralist). For example, one student (Latinx American, age 13) said, "there are many thoughts that go through a person's head when they see people of color that they are comfortable with *[individualist – people's belief]*... Americans have been conditioned to treat certain people a certain way and to put people in groups, which isn't good because everyone is different regardless of their race, ethnicity or culture *[structuralist – discrimination]"* Another student (black, age 15) connected personal beliefs with classism. "I think it [inequality] exist because some ethnicity's think some are better than the others *[individualist – people's beliefs]*. There is also an inequality in the United States because of where people come from for example the middle class, upper class, and the lower class *[structuralist – discrimination]* I don't think we should be split up into classes because we are all human beings." In these examples, the structuralist and individualist beliefs seem to interact with one another. People's beliefs affect person to person interaction and when

aggregated to communities or groups of people, racist, sexist, or xenophobic beliefs operate systematically as a type of discrimination.

For one Jamaican student, the direction of causality ran in the opposite direction. She explained, "Yes there is inequality in Jamaica. Because of race, type of family{poor or rich}, if your educated, your looks and your actions. Inequality exist because of people judging each other for unreasonable answers for their curious unimportant questions." In this case, societal (structural) constructions of race, wealth, and class affect people's perception (or judgement) of one another. Another very clear example of compound beliefs is the following example. A Black American student (age 13) explained, "I think there is inequality in the US and it exist because of the unjust people in the United states and the unjust law... There is always someone who is bias towards someone else creating inequality…Secondly, there is inequality in the US because of the unjust law system. For example, [some] people are unjustly put in prison for a longer amount of time just because of slight difference being, creed, class, or color." The structuralist belief referred to unjust law while the individualist belief referred to unjust people.

Overall, students in this study had a nuanced and complex understanding of inequality. They historicized inequality and connected issues of the past to current realities. Students discussed discrimination in terms of person to person interaction and group-level disenfranchisement. Students also discussed the role that power and politics play in maintaining the status quo, despite dissidence. They shared personal stories about witnessing (symbolic) racism in their communities and provided examples of discrimination including police brutality, islamophobia, racism, and sexism. These nuanced and complex rationalizations show a budding critical literacy (i.e. an ability to analyze political and social structures that uphold or make room

for dominant ideologies that oppress marginalized groups) (Freire, 1970). This budding critical literacy is not widely reported in studies done on adolescent or adult beliefs about inequality.

Differences across context.

I argue that Jamaican students were more likely than any other youth group to question or equivocate the existence of inequality in their context. For example, students said, "I don't think that there is a lot of inequality cases," "I believe there is some amount of inequality in Jamaica" and "Inequality may exist in just a few ways". The only student (Black Jamaican, age 13) who argued against the existence of inequality said, "No I do not think that there's inequality in Jamaica. I think everyone is treated equally and in my view we all play adequate roles in the society to make sure we live in equality." I conjecture that Jamaican students are less familiar with the term "inequality" than their American counterparts. In 2019 the two largest newspapers in Jamaica - the Jamaica Gleaner and the Jamaica Observer – published approximately 13 articles about inequality and the headlines of these articles foregrounded poverty, crime, or education. Moreover, many of the articles that provided detailed descriptions and statistics to characterize inequality were written to highlight foreign multi-lateral publications, like Oxfam's Commitment to Reducing Inequality report mentioned above. My point is that inequality is an important construct that is quite possibly much more salient in the American public conscience.

Another major difference between American and Jamaican responses was in their discussion of history. As mentioned above, 13 of the 38 structuralist responses were historical. However, in the Jamaican youth group, only two students mentioned history. One student (Black Jamaican, age 13) explained,

> During slavery things was set that the dark skin (black) was treated worse than the lighter skin (brown). So they basically show that back then the lighter skin were better. So its already in some people's mind that how its set because of slavery days.

In the excerpt above, the student talks about colorism, a particular type of racism that seeps into everyday living in Jamaica. The other student (Black Jamaican, age 16) explained, "I think classism originated from the days of slavery, where sometimes one is treated better due to their social status or the wealth that they possess." In every other historical example, slavery was seen primarily as the root of racism, not classicism. As mentioned above, 67% of Jamaicans' structuralist responses mentioned classicism. In comparison to the United States, Jamaica is racially homogenous with 92.1% of the population identifying as Black (The World Factbook, 2011). In the media, in political leadership, in business, in the church, Black people are economically, politically, and socially successful. As such racism is not as visible or visceral in Jamaica.

Differences with the stratifications beliefs literature.

Reviewing patterns.

Overall, this sample had 38 structuralist responses and 31 individualist responses. In the sections below, I show that the pattern in stratification beliefs across racial groups in this sample are similar to the literature on stratification beliefs. However, the types of individualist beliefs are qualitatively different. The table below shows differences in the type of responses across racial categories and context. Compound (18) stratification beliefs were most numerous, followed by pure-structuralist (17) and pure-individualist (13).

Table 10

Stratification beliefs across racial groups and context

	Race	n	Pure Individualist		Pure Structuralist		Compound		No Inequality	
American	Black	13	1	8%	6	46%	6	46%	0	0%
	Latinx	10	4	40%	2	20%	4	40%	0	0%
	White	6	3	50%	2	33%	1	17%	0	0%
	Asian	6	4	67%	1	17%	1	17%	0	0%
	Mixed / Other	3	0	0%	1	33%	2	67%	0	0%
Jamaican	Black	9	1	11%	3	33%	4	44%	1	11%
	Mixed	2	0	0%	1	50%	1	50%	0	0%
Total		**49**	**13**	**27%**	**17**	**35%**	**18**	**37%**	1	2%

According to Table 10, pure individualist responses were most common for Asian Americans (67%), White Americans(50%), and Latinx Americans(40%). Pure-structuralist responses were most common for Black Americans (46%) and Mixed Jamaican students (50%) and least common for Asian Americans (17%) and Latinx Americans (20%). Compound responses were the most frequently produced belief-type for all racial groups apart from White Americans (17%) and Asian Americans (17%).

Like Hunt (2007), I find that the White Americans in this sample produce a relatively high proportion of pure individualist beliefs and a lower proportion of compound responses. Black Americans had few pure individualist responses but had a high proportion of compound responses. Black Americans also had a fairly high proportion of pure structuralist responses in comparison to White Americans. Latinx American and Asian American students offered more pure individualist and fewer pure structuralist responses to the question of inequality than any other racial group. However, Latinx American respondents also offered a relatively high proportion of compound responses. These findings support the literature on stratification beliefs

comparing Latinx, Black, and White American's beliefs about inequality. For example, in Hunt's (2007) analysis of the General Social Survey from 1977 to 2004, Hispanic-Americans had high levels of pure individualist (26.8% in 2000-2004) and compound beliefs (28.4% in 2000-2004) relative to other racial groups. Black Americans had lower pure individualist beliefs (13.5% in 2000-2004) and higher levels of compound beliefs (33.2% in 2000-2004).

A Black Jamaican was the only student who said there was no inequality in her context. Jamaican students, both Black and Mixed were among the least likely to use pure individualist reasons to explain inequality in their context. Looking across samples, if we were to exclude the "no inequality" respondent, Jamaicans and Black Americans displayed a similar pattern in belief types – low percentage of pure individualist, medium to high percentage of pure structuralist, and high percentage of compound responses.

Qualitative differences with the literature.

The responses in this sample are very different from the types of individualist responses commonly discussed in the literature on political public opinion and stratification beliefs. Generally, individualist attributes of inequality (and poverty) place the blame on the poor. "Lack of will or motivation" and "lack of talent and ability" (Feagin, 1972; Hunt 2016; Kleugel & Smith, 1986) are the two most popular types of individualist responses. In cases where research on individualist beliefs are collected through forced-choice answers, people who had the opportunity to choose none (none of the answers above accurately describe my beliefs) represented only 4-6% of the sample in 1977 (Hunt, 2007). By 2004 this number had increased to 12-16% and scholars believe this reflects a liberalization of American's beliefs about inequality (Hunt, 2007). Still, studies that reported participants' self-constructed answers

produced similar patterns. In fact, in an open-ended survey, Flanagan et al. (2014) find that adolescents' individualist beliefs were quite similar to the adult beliefs reported in the General Social Survey. Examples of responses included, "people are poor because they are lazy and don't want to work hard" or "I would say they [the rich] were smart and went on to college." (Flanagan et al., 2014, p.5). Students in this sample who produced individualist attributes thus had a more complex understanding of inequality. To them, inequality is not simply about a person's inability to pull him or herself up by their bootstraps. Rather, inequality is the result of complex psychological and behavioral mechanisms that lead to differential treatment and discrimination.

Structuralist responses in the literature reflect systems-level causes of inequality like discrimination or disparities in access to quality education. In the Flanagan et al., (2014) study, adolescents spoke about job opportunities, welfare policy, birth/background, training, and discrimination. The major difference between this study and the literature is the prevalence of historical causes, namely slavery, and the connection made between slavery and present-day segregation. The literature on compound beliefs differs from this sample because the nature of individualist responses is generally focused on lack of ability or motivation (as mentioned above).

Discussion and Conclusion

This study departs from the literature in a number of ways. First, the individualist beliefs offered by students do not place the blame on the individual for being poor. They do not reflect beliefs in a meritocratic system, and they do not align with the "pull yourself up by your

bootstraps" mentality recorded in research on both adults and adolescents. Second, students use historical references to explain present-day inequalities like segregation and discrimination. Third, a new look at the Caribbean shows that when compared to American youth, Jamaican youth equivocate when discussing inequality, focus on classicism and discount history. Indeed, the lived experiences across class, race, and geography for these students are different. The politics and history of racism is more foregrounded in public discourse in the states, while classism and colorism are more prevalent issues in Jamaica. The political climate is also very different. The two leading political parties in America juxtapose liberal values against conservative values, particularly with respect to immigration policy, trade, and national security. In Jamaica, the two leading political parties are generally center-left, with both parties adopting similar approaches to economic growth, corruption, and crime

Design implications.

Students are already engaged in the difficult cognitive task that is a structural analysis of inequality. Youth readily identify the injustices of the current economic and social system and in many cases provide examples where policy and the personal intersect to exacerbate discrimination. The significance of this study is in the illustrative excerpts that show the kinds of ideas that youth wrestle with. Educators must understand the range of these ideas when designing learning environments. In this sample, youth the range of ideas included Trump's presidency, history of slavery, hyper-incarceration of African American men, Jim Crow, and classism. To help youth develop richer and more critical analyses of sociopolitical systems, educators could help them rationalize racist encounters (for example, seeing the confederate flag publicly displayed in their communities) by historicizing these experiences - educators could

teach youth about the origin of the confederate flag. In the case of Jamaican students, understanding the legacy of colonialism will be critical to helping students develop richer accounts of inequality in the present-day.

Epilogue

In this dissertation, I explored three concepts – equity, self-efficacy, and inequality. In study 1, I showed how a STEM-focused non-profit organization (NPO) grappled with multiple equity frames and reflected on the silence around more radical equity frames that push for a reconfiguring of relations between STEM, power, and justice. In study 2, I showed that participants' perceptions of their abilities as leaders, coders, and designers changed over the course of the intervention. Self-efficacy and its relevance to the development of interdisciplinary curricula that seeks to develop technical skill and civic identity has been overlooked in the literature. One of the contributions that I make to the literature on self-efficacy are two psychometric constructs with high internal consistency– design-thinking self-efficacy (DTSE), which is a new construct, and leadership self-efficacy (LSE), which is understudied in the K-12 population. DTSE can be used by the numerous design-thinking programs emerging in the educational field, and LSE can be used to attune our attention to youth civic leaders' development. In the third study, I show that American and Jamaican youth in this sample have a nuanced and complex view of inequality. I offer a qualitative and contextual analysis of understudied youth groups (Asian American and Caribbean) to the literature on people's beliefs about inequality. Additionally, the methods I used offer illustrative excerpts that show the kinds of ideas that youth wrestle with.

Future work will delve into the iterations of the curriculum over three years. This design-based research study will also provide more nuanced explanations of the relationship between self-efficacy and critical consciousness. I am interested in examining the impact that camp identity and other social identities have on the social justice/civic issues that the campers chose and the types of solutions created. These studies will enable more nuanced cross-cultural analyses that attend to sociopolitical factors influencing student thinking and engagement. I am also interested in studying youth's understanding of political systems and traumatic political events at different adolescent stages.

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Appendix A

d.school Mindsets

(taken from bootcamp bootleg published by the Hasso Plattner Institute of Design at Stanford)

- **Show don't tell -** Communicate your vision in an impactful and meaningful way by creating experiences, using illustrative visuals, and telling good stories
- **Focus on human values -** Empathy for the people you are designing for an feedback form these users is fundamental to good design
- **Craft clarity** –Produce a coherent vision out of messy problems. Frame it in a way to inspire others and to fuel ideation.
- **Embrace experimentation** - Prototyping is not simply a way to validate your idea; it is an integral part of your innovation process. We build to think and learn.
- **Be mindful of process** - Know where you are in the design process, what methods to use in that stage, and what your goals are.
- **Bias toward action** - Design thinking is a misnomer; it is more about doing that thinking. Bias toward doing and making over thinking and meeting.
- **Radical collaboration** - Bring together innovators with varied backgrounds and viewpoints. Enable breakthrough insights and solutions to emerge from the diversity.

Table A1: Self-efficacy questionnaire

#	Survey SE Scale	Item
17	Leader	[I have mentors who help me and give me advice.]
1	Leader	[I am confident in my public speaking.]
2	Leader	[I enjoy working with others on a team.]
3	Leader	[I am good at managing my time.]
4	Leader	[I am good at conflict resolution.]
5	Leader	[I am good at listening to others.]
6	Leader	[I feel like I can make a difference.]
7	Leader	[I am confident in leading a discussion with my peers]
8	Leader	[I am believe I can inspire others.]
10	Leader	[I believe that I can make a difference in my school and community]
11	Leader	[I feel that I have something to contribute to my community
15	Leader	[I feel that my voice is heard by others.]
18	Leader	[I am a leader.]
30	Leader	[I feel comfortable trying new things.]
31	Leader	[I see problems as opportunities.]
9	Design-Thinking	[I am confident interviewing others.]

12	Design-Thinking	[I am good at giving and receiving feedback.]
16	Design-Thinking	[I feel like I can design creative solutions to problems]
21	Design-Thinking	[I want to be a designer.]
22	Design-Thinking	[I am comfortable building a paper prototype.]
23	Design-Thinking	[I identify as a designer.]
24	Design-Thinking	[I am comfortable building a wireframe.]
25	Design-Thinking	[I am confident that I am able to identify a feasible social issue to tackle]
27	Design-Thinking	[I am able to find patterns and develop insights from interviews]
28	Design-Thinking	[I feel comfortable adding to my work to make it better]
29	Design-Thinking	[I want to learn about other's experiences to be able to help them]
32	Design-Thinking	[I feel confident communicating my ideas to others]
13	Coding	[I know how to build a website.]
14	Coding	[I understand how HTML works.]
19	Coding	[I feel confident at coding.]
20	Coding	[I want to study computer science in school.]
26	Coding	[I identify as a computer scientist.]

Table A2: Coding scale - correlation and covariance table

Coding Survey Item	Obs	Sign	Item-test correlation	Item-rest correlation	Average interitem covariance	Alpha
Q26_Before	55	+	0.7817	0.667	0.6608866	0.7274
Q13_Before	55	+	0.709	0.5302	0.6836139	0.7619
Q20_Before	55	+	0.7098	0.5048	0.6679574	0.7735
Q19_Before	55	+	0.7253	0.5437	0.6615039	0.7581
Q14_Before	55	+	0.7834	0.6273	0.6028058	0.7297
Test scale					0.6553535	0.7896

Coding Survey Item	Obs	Sign	Item-test correlation	Item-rest correlation	Average interitem covariance	Alpha
Q26_After	49	+	0.8091	0.6117	0.3040675	0.7235
Q13_After	49	+	0.7028	0.5877	0.4360828	0.7408
Q20_After	49	+	0.724	0.4849	0.3660714	0.7727
Q19_After	49	+	0.7494	0.6155	0.3874008	0.7208
Q14_After	49	+	0.7407	0.6146	0.4002976	0.7249

Test scale					0.378784	0.7772

Table A3: Design scale - correlation and covariance table

Design thinking survey item	Obs	Sign	Item-test correlation	Item-rest correlation	Average interitem covariance	Alpha
Q9_Before	55	+	0.5941	0.46	0.250603	0.7681
Q12_Before	55	+	0.5828	0.4881	0.2642179	0.7667
Q21_Before	55	+	0.5266	0.3848	0.2618916	0.7765
Q22_Before	55	+	0.6394	0.5148	0.2434711	0.7615
Q23_Before	55	+	0.6335	0.5103	0.2452403	0.762
Q24_Before	55	+	0.415	0.281	0.2806367	0.7854
Q25_Before	55	+	0.5252	0.4214	0.2703765	0.7723
Q16_Before	55	+	0.6075	0.5128	0.2600367	0.7641
Q27_Before	55	+	0.5559	0.4321	0.2603428	0.7708
Q28_Before	55	+	0.5521	0.4611	0.270199	0.7698
Q32_Before	55	+	0.4487	0.2897	0.2731068	0.7879
Q29_Before	55	+	0.554	0.4703	0.2724334	0.77
Test scale					0.262713	0.7864

Table A3 continued

Design thinking survey item	Obs	Sign	Item-test correlation	Item-rest correlation	Average interitem covariance	Alpha
Q9_After	49	+	0.6189	0.5329	0.2903602	0.8601
Q12_After	49	+	0.6417	0.5634	0.2898268	0.8584
Q21_After	49	+	0.4956	0.3552	0.2961889	0.8758
Q22_After	49	+	0.7342	0.6657	0.2762214	0.8517
Q23_After	49	+	0.6022	0.4976	0.2863559	0.8629
Q24_After	49	+	0.5568	0.4266	0.2875541	0.8703
Q25_After	49	+	0.7385	0.6785	0.2812307	0.8519

					0.277643	
Q16_After	49	+	0.7839	0.7335	8	0.849
Q27_After	49	+	0.7452	0.6806	0.276167 3	0.850 9
Q28_After	49	+	0.6738	0.615	0.294859 3	0.857 1
Q32_After	49	+	0.6305	0.539	0.285984 8	0.859 7
Q29_After	49	+	0.6611	0.591	0.290507 1	0.857 2
Test scale					0.286075	0.869

Table A4: Leadership scale - correlation and covariance table

Leadership Survey Item	Obs	Sign	Item-test correlation	Item-rest correlation	Average interitem covariance	Alpha
Q17_Before	55	+	0.348	0.2333	0.3353214	0.876
Q1_Before	55	+	0.5875	0.4874	0.3056539	0.8641
Q2_Before	55	+	0.4921	0.4106	0.3251597	0.8662
Q3_Before	55	+	0.4253	0.323	0.3280255	0.871
Q4_Before	55	+	0.5543	0.4859	0.3223388	0.8632
Q5_Before	55	+	0.4468	0.3622	0.3293205	0.8681
Q6_Before	55	+	0.8	0.7577	0.2961911	0.851
Q7_Before	55	+	0.6453	0.5585	0.3003423	0.8598
Q8_Before	55	+	0.7748	0.7339	0.304532	0.8535
Q10_Before	57	+	0.6677	0.6048	0.3088023	0.8588
Q11_Before	57	+	0.668	0.6099	0.3114093	0.8587
Q15_Before	55	+	0.7045	0.6491	0.306888	0.8562
Q18_Before	55	+	0.7451	0.6867	0.2958545	0.8533
Q30_Before	55	+	0.6477	0.576	0.3072823	0.8589
Q31_Before	55	+	0.5441	0.4663	0.3199924	0.8639
Q29_Before	55	+	0.3733	0.3019	0.3391199	0.8697
Test scale					0.3147648	0.8697

Table A4 continued

	Obs	Sign				Alpha

Leadership Survey Item			Item-test correlation	Item-rest correlation	Average interitem covariance	
Q17_After	49	+	0.6205	0.5806	0.3546122	0.9247
Q1_After	49	+	0.7839	0.7349	0.318763	0.9201
Q2_After	49	+	0.2803	0.1926	0.3699287	0.9346
Q3_After	49	+	0.6757	0.6174	0.3353645	0.9234
Q4_After	49	+	0.4691	0.3931	0.3544866	0.9293
Q5_After	49	+	0.6967	0.6384	0.3312721	0.9229
Q6_After	49	+	0.8404	0.8106	0.3249185	0.918
Q7_After	49	+	0.751	0.7055	0.3304206	0.9208
Q8_After	49	+	0.8175	0.7852	0.3285058	0.9188
Q10_After	47	+	0.7061	0.6567	0.3357997	0.9222
Q11_After	47	+	0.7065	0.6634	0.3406004	0.9222
Q15_After	49	+	0.8179	0.7798	0.3206814	0.9185
Q18_After	49	+	0.8583	0.8263	0.3146354	0.9169
Q30_After	49	+	0.6717	0.628	0.345977	0.9233
Q31_After	49	+	0.7406	0.7006	0.3378392	0.9213
Q29_After	49	+	0.6519	0.6024	0.3446296	0.9237
Test scale					0.3367781	0.9272

Table A5: Cronbach alphas for self-efficacy scales

Cronbach Alphas	Pre	Post
Coding	0.79	0.78
DT	0.79	0.87
Leadership	0.87	0.93

Appendix B

Table B1: Examples of stratification beliefs codes

Code	Meaning
Structuralist	Refers to systems-level, societal, or structural causes of inequality
Structural-historical	Uses history to explain how or why structures that cause inequality exist or existed
Structural-political	Uses politics to explain how or why structures that cause inequality exist or existed
Individualist	Refers to personal action, ability, or characteristics as causing inequality
People's beliefs	Refers to people's beliefs as causing inequality or the root of discrimination
People's treatment	Refers to people's treatment of others as causing inequality or the root of discrimination
Compound	Refers to responses that have both structuralist and individualist codes