Resisting Racism in Tech Design: Centering the Experiences of Black Youth

YOLANDA A. RANKIN, Florida State University, USA

KALLAYAH K. HENDERSON, Northwestern University, USA

Speech-based interfaces that feature conversational agents have a diverse population of users, including children. While recent HCI research has investigated child-agent interactions in the context of speech-based interfaces with rare mention of sample populations' racial makeup, scant research has examined how racially minoritized groups, in particular Black youth, interact with such technologies. Subsequently, issues of race and racism continue to be largely neglected within the HCI community, contributing to technology that marginalizes Black people. Leveraging Black feminist epistemology as a critical framework, we engage Black students in the ideation process of conversational agents as speech-based interfaces, drawing attention to how race, gender, and class influence their design choices. Our findings reveal that Black students prefer custom-designed conversational agents that are modeled after Black women, possessing knowledge of Black culture and serving as life coaches to help them achieve their goals. We also confirm that the current design of speech-based interfaces perpetuates racism, reinforcing whiteness as the norm.

CCS Concepts: • **Human-centered computing** → **Collaborative and social computing**.

Additional Key Words and Phrases: Black feminism, Black youth, conversational agents, racism, speech-based interfaces

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1 INTRODUCTION

In the context of who designs technology and for whom, technology has proven to be less diverse, reflecting racist ideology and fostering social inequality for Black people as noted in the excerpt below:

A former Apple employee who noted that he was “not Black or Hispanic” described his experience on a team that was developing speech recognition for Siri, a virtual assistant program. As they worked on different English dialects – Australian, Singaporean, and Indian English – he asked his boss: “What about African American English?” To this his boss responded: “Well, Apple products are for the premium market.” [8, pg. 29]

The idea that Black people are a less desirable customer market, and therefore, technology should not be designed to cater to their needs or interests demonstrates how racism operates behind the scenes. Such racist ideology permeates much of the technology designed for a global market and reveals that technology is not so colorblind or immune to racism after all [8, 15, 35, 55]. For

Authors' addresses: Yolanda A. Rankin, Florida State University, 142 College Loop, Tallahassee, FL, USA, yrankin@fsu.edu; Kallayah K. Henderson, Northwestern University, 633 Clark St, Evanston, IL, USA, kallayahhenderson2025@u.northwestern.edu.

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example, speech-based interfaces that feature conversational agents such as Google Assistant, Amazon's Alexa or iPhone's Siri represent one of the most pervasive technologies used by a diverse population [9, 18]. In the context of Computer Supported Cooperative Work and Social Computing (CSCW) and Human-Computer Interaction (HCI) research, their pervasiveness and popularity has spurred interest in how children interact with these conversational agents, especially since these technologies were not initially designed to support child-agent interactions [32, 53, 66, 76]. However, when we use racial identity as a critical lens for investigating child-agent interactions, close scrutiny of HCI literature reveals a dearth of research that explicitly examines Black children's social interactions with conversational agents as a means of understanding the world around them [6, 7, 17, 32, 53, 66, 76].

On the surface, this may seem like a mere oversight. However, from the perspective of Black women scholars, the lack of research concerning Black people and their relationship with technology renders Black children, women and men as being invisible while reinforcing whiteness as the dominant culture in the fields of CSCW and HCI [59, 62]. This represents just one example of how racism insidiously operates in CSCW and HCI [34]. Moreover, the accepted practice of recruiting Black children as participants in user studies for the sake of diversity without an investment in their ability to create or design technology attests to the exploitation of Black children as human subjects, another example of racism in CSCW and HCI [34, 38, 63]. Understanding the role of speech-based interfaces in Black children's lives becomes essential for designing conversational agents that appeal to and reflect the needs of a diverse user population, including those children who are members of marginalized or minoritized populations. At a minimum, the CSCW and HCI communities writ large must take action to call out racism in the context of design practices, research methodologies, and scholarly work as acts of oppression. Most importantly, within the fields of CSCW and HCI, we must employ critical frameworks that enable us to actively resist oppression in its various forms, embracing such research as resistant knowledge projects.

Turning a critical eye towards existing design practices and methodologies in the field of CSCW and HCI, we utilize Black feminist epistemology [34, 62, 63] to align our work with more socially just oriented research [23, 27, 28, 70]. As Black women scholars, our *intersectional identities of race and gender* [21, 22, 62] provide an *outsider-within* viewpoint [20] of interconnected power relations and politics within the fields of CSCW and HCI that engender racism, sexism, gendered racism, heteropatriarchy and other forms of oppression. Acknowledging both our marginalized position as Black women and our privileged position as scholars in the fields of CSCW and HCI, our unique vantage point affords us the epistemic agency to examine how race, gender and class influence the design of technology and how this contributes to systemic racism in the fields of CSCW and HCI and the technology sector as a whole. Because we identify as Black feminists whose interests reflect the ideological, political and economic issues pertinent to Black women, issues that differ from the dominant White culture, we also embrace *Black feminist thought* as a critical framework to resist racism and other forms of oppression [20, 34, 62, 63, 69].

In contrast to previously published HCI literature of child-agent interactions [6, 7, 17, 32, 53, 66, 76], Black youth between the ages of 9 and 17 years old, who attend an afterschool program at a local youth community center, become the focal point as an act of resistance against racist design practices. In this paper, we leverage *Black Feminist Thought (BFT)* [20] to explore Black youth's social interactions with speech-based interfaces, sharing the details of how ten Black students perceived, interacted with, and adapted to conversational agents as a means for understanding the world around them. Over the course of seven design sessions, we engage them in the ideation process of their own individual conversational agents to better understand the role that conversational agents could potentially play in the lives of Black youth. We pose the following research questions:

- (1) In the context of, their everyday lived experiences, which aspects of Black youth's engagement with speech-based interfaces are prominent and why?
- (2) Applying Black feminist epistemology as a critical framework for analysis, what roles do race, gender, and class play in Black youth's ideations of their conversational agents?
- (3) In the context of Black youth's lived experiences, in what ways (if any) do speech-based interfaces that feature conversational agents perpetuate racism?

This paper makes the following contributions: Building upon previous HCI child-agent interaction research which largely neglects how race influences the design and use of speech-based interfaces [6, 7, 32, 53, 66, 76], we empower the voices of Black youth, an often overlooked and understudied population in HCI research, as the primary focus in this exploratory study. Sharing information previously unknown about Black youth's motivations for interacting with speech-based interfaces, our findings show that Black students desire conversational agents that function as both personal assistants and life coaches, giving them administrative and emotional support as they work towards achieving their life goals. Applying Black feminist epistemology (BFT and intersectionality) as a critical framework, we learn that Black boys and girls have a positive perception and appreciation of Black women, with the majority choosing Black women as the ideal personification of their individually designed conversational agents. Results from our study lead to insights that identify and resist racist design practices to better accommodate the needs and interests of Black youth and other marginalized populations.

2 RELATED WORK

We summarize related literature about children's interactions with conversational agents, methods for co-designing technology for and with children, and the paucity of HCI research that centers Black youth as designers of technology.

2.1 Overview of HCI Child-Agent Interaction Research

Child-agent interaction research has primarily involved young children under the age of 13, revealing a need for improved automatic speech recognition systems to address the challenges that young children encounter when communicating with conversational agents. For example, Sciuto et al. [66] collect data about children's interactions with Amazon's Alexa in a home environment. Despite having parental support, young children, some less than 4 years old, experience difficulties engaging in conversations with Alexa due to pauses in their speech utterances and their failure to comprehend that Alexa is incapable of visual perception (e.g., "Alexa, what color is the crayon?") [66].

Lavato and Piper [53] found that children 7 years old and younger used Apple's Siri primarily for exploration, information seeking, and functional tasks. The children engaged in exploration by asking questions about Siri's personal preferences and characteristics in addition to demonstrating information-seeking behaviors when they asked questions about school or general information about their immediate surroundings. The children also asked Siri to perform functional tasks, such as making phone calls, sending text messages, or playing music or videos, demonstrating a better understanding of Siri's limitations [53].

In another study, Druga et al. [32] explored the different ways children ages 3-10 years old interacted with and perceived autonomous technology (i.e., Amazon Alexa, Google Home, an AI toy robot, and Julie Chatbot) at different developmental stages. Overall, the children found the agents to be friendly and trustworthy. However, children between 3 and 4 years of age had more difficulty communicating with the conversational agents and treated them like people (e.g., "Hey Alexa, how old are you?") [32]. In comparison, older children between the ages of 6 and 10 years

old thought the agent was smarter than them because they related the agents' intelligence to its access to information [32]. Additionally, older children were more likely to test the agent by asking it to do human tasks (e.g., "Can you open a door?") [32].

Yarosh et al. [76] conducted a study of a group of children between the ages of 5 and 12 years old as well as their parents or guardians using a Wizard-of-OZ simulated voice assistant. Generally, children struggled with reformulating their questions in attempts to be understood by the conversational agent [76]. However, these difficulties decreased with the child's age [76]. The children also preferred personified agents that referred to themselves using first-person pronouns more so than conversational agents who used third-person pronouns for self-identification [76], indicating the need to establish rapport as a key component to meaningful child-agent interactions.

Acknowledging the growth of research in child-agent interactions, none of the aforementioned studies specifically examined teenagers' or adolescents' interactions with speech-based interfaces that feature conversational agents. Furthermore, the racial identity of child participants in previous studies of speech-based interfaces is largely ignored with a few noted exceptions [17, 36]. Though Cassell et al. [17] and Finkelstein et al. [36] investigate the impact of social interactions with conversational agents on Black children's development of mainstream literacy skills, these studies do not evaluate if such technology actually affirms Black students' racial identity or sociocultural norms, nor do they position Black students as designers of speech-based interfaces. This remains significant in that speech-based technologies represent a pervasive technology used by a diverse population, and yet scant HCI research has examined the ramifications of designing technology for dominant social groups at the expense of historically excluded populations (i.e., Black Americans). We identify this as an opportunity to address racial inequalities in future research.

2.2 Designing Technology for Children, with Children

Prior HCI research demonstrates that children can function in the role of designers if given proper guidance and support for doing so. Cooperative inquiry represents an alternative design approach for creating technology for children with the caveat that children are also positioned as co-designers of technology [33]. In contrast to adult-driven design methods, cooperative inquiry places value on children's unique perspectives since they represent the target group of users [33]. Because children are the focal point in the technology design process, cooperative inquiry consists of a variety of design activities (i.e., big paper, mixing ideas, storyboarding, bags of stuff, stickies, and kid reporter) appropriate for guiding children through the early stages of design [33, 37].

Woodward et al. [75] engaged seven children between the ages of 7-12 in participatory design (PD) of Intelligent User Interfaces (IUI). Over the course of four PD sessions, the children created speech-based IUIs that featured customized conversational avatars with human facial features, in different colors and demonstrating different attitudes (e.g. sassy or sweet) [75]. Subsequently, the children expected their conversational avatars to behave like humans do, exhibiting emotional intelligence and seeking clarification when it did not understand the user's speech.

Brown et. al [14] introduced clear panel, a mixed-fidelity prototyping technique, to engage seven children aged 8-14 years old and seven adult researchers in three 90-minute PD sessions of a mobile application for teaching math concepts. Combining high-tech prototyping with low-tech sketching [14], participants were divided into smaller groups where each group was provided a mobile device, clear panels, and a permanent marker to complete their design tasks [14]. The use of clear panel prototyping contributed to their awareness of design constraints specific to mobile applications (e.g., limited screen real estate).

Walsh et. al [72] conducted a study using another version of the PD method - distributed cooperative design. Distributed cooperative design enabled geographically distributed participants to work together asynchronously to design new children's technologies through the use of an

online tool called *Disco* [72]. Leveraging the concept of intergenerational co-design [77], the study consisted of twenty child participants between the ages of 7-11 years old and twelve adult participants who represented researchers in multiple fields of study (i.e., Education, Computer Science, and Information Science). The intergenerational co-design teams developed five prototypes using *Disco* over the course of 18 months.

Though these previously mentioned studies demonstrate children's ability to function as designers of technology, none of these studies intentionally recruited or engaged Black children, a marginalized population, in the design of technology. As Black feminist technologists in HCI, we consider this to be more than just an oversight as too few research studies specifically examine Black students' motivations for utilizing or designing technology [59, 60]. Instead, the accepted practice within the CSCW and HCI communities has been to ignore the issue of race [56, 69], which results in the erasure and exclusion of racially defined groups (i.e., Black Americans). According to *critical race theory* [26], racism is defined as any system or practice of discrimination, segregation, persecution, or mistreatment based on membership in a race or ethnic group. Racism, a structured system of power oppression, does exist within the HCI and CSCW communities [34, 62, 63]. As such, we draw attention to racist design practices that oppress Black people. The common practice of ignoring race as an exemplar of colorblind practices, thought to equate to fair and equitable opportunities for people of color, demonstrates how racism works insidiously behind the scene, rendering racial groups invisible within the larger HCI community while conveying a subliminal message about who gets to design technology [34]. For clarification purposes, we are not accusing our colleagues of being racist. However, we caution our colleagues to remember that racist design practices do benefit those who are in positions of power and privilege, even if scholars who conduct such research which engages historically excluded groups do so with the best of intentions [38, 40].

2.3 Prior Research that Positions Black Youth as Designers

Less HCI research has intentionally positioned Black youth as designers, with recent research leveraging the appeal of games as the gateway for transitioning Black children from being consumers of technology to being producers of technology [61]. For example, DiSalvo et al. [43] examined Black males in the role of gamers who playtest video games as a mechanism for constructing their computing identities. However, being a gamer aligns more with being a consumer of games rather than a creator of games. In contrast, Thomas et al. [71] conducted a longitudinal study of Black middle school girls as they collaboratively created video games for multiple platforms, including web-based and mobile games. Looking beyond the field of HCI, Sheridan et al. [67] endorsed culturally relevant pedagogy as an effective approach to game design, positioning Black youth and their culture as assets in the technology design process. In yet another game study, Black students applied science concepts to create educational games that motivate STEM learning [11].

More research outside the scope of HCI literature has sought to create more inclusive and equitable design practices that benefit Black students. Shifting the focus to the creation of non-gaming artifacts, one elementary girl developed a digital story to reflect what it means to be multiracial "in a bivariate family and world," combating negative racial stereotypes of Black girls (i.e., "very loud") [51]. Hatley and Washington [39] created Youth Applab, an out-of-school program that teaches Computer Science (CS) and Software Engineering to Black students. Over a four-year period, these same Black students developed into experts as they taught newcomers crucial CS and software engineering concepts necessary for developing their own software applications [39]. Digital Youth Divas, an out-of-school program developed by Pinkard et al. [58], provides a narrative-centered, blended learning program (virtual and real-world communities) that supports Black and Brown middle school girls' sense of STEM agency, identities, and interests via the creation of digital artifacts (i.e., fashionable e-bracelets). Such research points to the empowerment of Black youth

as producers of technology, demonstrating that any marginalized group, with access to the right resources and multiple paths to success, has the potential to make meaningful contributions to the field of HCI.

In the context of HCI research relevant to speech-based interfaces, we found even fewer studies that focused on Black youth. Beneteau et al. [6, 7] investigated family members' interactions with Amazon Echo Dot, but only included one Black family with children as participants. Druga et al. [31] conducted an international study that examined the artificial intelligence literacy of children from around the world. Despite the inclusion of "African-American children," there was no explicit explanation of how their interactions with conversational agents (i.e., Jibo robot, Amazon's Alexa, and Anik's Cozmo robot) compared to the interactions of children outside of the U.S. This particular study also conflated nationality with race, misusing the label "African-American" to represent a nationality rather than a racialized group [31]. The findings from these studies assumed that race played an insignificant role in the consumption or use of conversational agents. Furthermore, none of these studies provided any information regarding how interactions with speech-based interfaces affirmed or disavowed the racial identity and/or culture of Black Americans. Therefore, we argue that more research that centers Black people is needed.

3 BLACK FEMINIST EPISTEMOLOGY IN CSCW AND HCI

Epistemology refers to the theory of knowledge that demonstrates "which power relations shape who is believed and why" [20, pg. 270]. Our intersectional experiences as being both Black and women constitute a way of knowing that positions us as experts or agents of knowledge in the struggle for our humanities [20, 21]. Speaking truth to power about our experiences as Black women in America, including those in the field of HCI, reveals how we are subjugated to differential treatment when compared to White women [20, 34]. For example, the research of Black women in the field of HCI who work with historically excluded populations is often dismissed as service whereas White women (and White men) who do similar research are recognized as legitimate scholars whose contributions push the field forward, enjoying a degree of power and privilege denied among Black women scholars [62]. As Black women, we struggle to be heard among a community of scholars whose membership largely reflects the prioritized White dominant group, its knowledge production processes, interpretive community, and epistemic culture, one that typically ignores or devalues Black women. Given this dilemma, as Black women scholars in CSCW and HCI, we value epistemic equality in which "all members have equitable access to being treated equally, speaking freely, and being heard." [29] Exercising our sense of epistemic agency, we embrace Black feminist epistemology to shine a light on how racism, power and privilege negatively impact the lived experiences of Black people in the U.S. Therefore, we choose to integrate *Black Feminist Thought (BFT)* and *intersectionality* as critical frameworks that justify the theoretical underpinnings of our work.

3.1 Intersectionality

Collins & Bilge [22] define intersectionality as a critical framework for grappling with overlapping social constructs including but not limited to race, gender, ethnicity, sexuality, class and ableism that shape the lived experiences of marginalized populations (e.g., Black children of low socioeconomic status). Though Crenshaw [24, 25] is credited for using the word intersectionality first, the origins of intersectionality date back to the early 19th century when Black women such as Sojourner Truth, Harriet Tubman, Ida B. Wells and others used an intersectional lens to identify and push against oppressive forces such as gendered racism [22]. Intersectionality as a critical social theory has a long history of empowering Black women, Chicanas, Asian-American women and Native American women to be politically active in the fight against *the matrix of domination* that reflects

interconnected power structures of race, class, gender, sexuality and nation [21, 22]. Intersectionality examines how dominant populations wield and protect power at the expense of those social groups who are less enfranchised because of their intersectional identities [21]. These systems of oppression work together to construct inhumane living conditions such as police brutality, mass incarceration, poverty, lack of access to educational resources and health disparities that affect people of color and their communities [62]. Used as an analytical tool, intersectionality exposes the myriad of power relations that motivate racism, White supremacy, sexism, homophobia, xenophobia, capitalism, and the list goes on [21, 22]. The power of intersectionality lies in its ability to not only identify and criticize these systems of oppression, but to also advocate for social change that seeks to reform (work within) existing infrastructures or transform them altogether [21].

3.2 Black Feminist Thought

The Combahee River Collective, a group of Black women which included Audre Lorde, Cheryl Clarke, Demita Frazier, Barbara Smith, Beverly Smith, and many others [19], gave birth to the Black feminist movement which began circa 1974. This collective of Black women was committed to the fight against racism, sexism, heterosexism, and class oppression which “all women of color face” [19]. An ideological, political and economic movement, Black feminism was based on the shared belief that Black women were inherently valuable as human beings. The Combahee River Collective [19] reiterates the significance of Black women defining their own political agenda to contend with the various forms of oppression that negate their humanity as stated below:

“Our politics evolve from a healthy love for ourselves, our sisters and our community which allows us to continue our struggle and work ...We believe that the most profound and potentially most radical politics come directly out of our own identity as opposed to working to end somebody else’s oppression.” [19]

Leveraging Black women’s intersectional identity, BFT takes into account the unique position in which we often find ourselves constantly plagued with various forms of oppression that are perceived as inconsequential to dominant social groups [20, 21, 41, 52]. Black women in the U.S. share the historical legacy of slavery which established institutional racism “and accompanying discriminatory practices designed to deny U.S. Blacks equitable treatment” [20, pg. 26]. Though the Civil Rights Movement worked towards equal rights for Black people in the U.S., “racial segregation remains deeply entrenched in housing, schooling, and employment [30].” Consequently, Black women remain oppressed.

Likewise, the children of Black women also share this same historical legacy, reaping the same negative impacts of racism. For example, many Black children experience racism within the educational system, including the lack of access to educational resources and opportunities (i.e., lack of CS courses in K-12 education, no free STEM summer camps, etc.) attributed to predominantly Black low socioeconomic neighborhoods [46]. Black children live with a false narrative of a *colorblind* society in which children, because of their race, are disadvantaged and declared deficient, creating social inequalities that are mistakenly blamed on those who are actually oppressed in this same *colorblind* society [16, 46]. Just as Black women in the U.S. live in a different world from that of people who are not Black and female, children born of Black women experience a very different kind of reality than White children, a reality in which White supremacy, power and privilege create an unlevel playing field for Black children. As Black feminists in HCI, we leverage crucial components of BFT to inform our approach for working with Black adolescents as part of an afterschool program whose mission is to help this particular group of students develop life skills and prepare for a college education with the hopes of transforming their economic status. We discuss three components

of *Black feminist thought* that inform our research approach: 1. *othermothering*; 2. *the power of self-definition*; and 3. *dialogical interactions with Black youth*.

3.2.1 Othermothering. Given the challenges that Black children face growing up in the U.S., *BFT* emphasizes Black mothers' or bloodmothers' roles as both protectors and educators of their own biological children, teaching them crucial life skills for navigating the twists and turns of growing up Black in America [20]. However, not all Black feminists are bloodmothers. Weems introduces the concept of othermother - a Black woman who "did not have the onus of providing for me, and so had the luxury of talking to me." [73, pg. 27]. The distinction of not being a bloodmother or a caregiver does not absolve Black feminists of their responsibility to Black children. For generations, Black women have othermothered fictive kin when biological parents were unable to fulfill their obligations [20, 68]. A signifier of Black feminist practice, Black women activists' political commitment to care for and protect Black children, a vulnerable and often preyed upon population in society, speaks to their understanding of how racism feeds upon Black children's self-worth, self-confidence, sense of agency and their dreams of the future. Patricia Hill Collins [20] introduces the traditional *community othermother*, which explains the "mothering the mind" relationships that often develop between Black women and Black female and male students. These *community othermothers* are about the business of creating safe havens within the community that affirm Black students' identities and provide protection from hostile environments.

3.2.2 The Power of Self-Definition. Building upon this concept of the *community othermother*, as Black feminist technologists, we choose to do more than just support the development of Black children's technical skills (STEM, computational, digital literacy, etc.) or provide them with access to computing education resources. Instead, we utilize *the power of self-definition* to position Black adolescents in the role of designers of technology as the focal point of this resistant knowledge project [21]. *Self-definition* as a design practice eliminates Whiteness as the accepted norm in terms of who creates technology and challenges the misconception that technology should be designed to cater to a premium customer base of non-Black users [8]. Recognizing that Black children are just as capable of being innovators as anyone else, we intentionally make room for all Black students, regardless of race, gender, age, grade or economic status, to inform how technology should be designed. Creating an opportunity for Black youth to imagine technology that reflects their identity and their vision of the future exemplifies the *power of self definition* [20]. Black children rarely have opportunities to define or shape technology or determine its appropriation based on their lived experiences.

3.2.3 Dialogical Interactions with Black Youth. Black children represent a heterogeneous population with diverse perspectives of the Black experience that are largely influenced by their gender identities, economic status, sexual preferences, physical abilities, etc. In addition, Black youth possess intimate knowledge of what it means to grow up as a Black child in America, rightfully positioning them as *agents of knowledge* whose lived experiences exemplify testimonial authority [21]. In an attempt to make salient the diversity of lived experiences, we intentionally engage Black youth in dialogical interactions to empower their voices, affirm diverse viewpoints, and understand how speech-based interfaces that feature conversational agents can be designed to better accommodate their specific needs.

4 STUDY OF BLACK YOUTH'S INTERACTIONS WITH SPEECH-BASED INTERFACES

4.1 Position Statement

Embracing standpoint theoretical practices [39], we include a position statement indicative of the authors of this paper. The authors represent two Black women who have strong interests in the

disruption of hegemonic normativity in technology design, especially in the HCI community. One co-author is a Black woman faculty member at a predominantly White institution in the southeastern United States. This same co-author has over 20 years of experience navigating the computing industry and working within Black communities to provide exposure and access to technology while positioning Blacks as producers of technology. She describes herself as a community othermother, one who willingly accepts the responsibility of nurturing young Black lives. The second co-author is a Black woman graduate student at a predominantly White research institution and has firsthand experience of being a Black woman in the field of computing. Together, we are committed to the empowerment of Black women and uplifting the Black community, and of being in relationship with members of the Black community for the purpose of making salient our lived intersectional experiences [18, 39, 85]. In essence, we have a posteriori knowledge about marginalization in HCI spaces and computing, more broadly. As Black women intellectuals, we move fluidly between the roles of researcher and designer throughout this study. Furthermore, we interchangeably use Black to refer to all people of the African diaspora. Finally, we bracket our various sets of assumptions by including all variations of Black perspectives throughout this design process, not rejecting those experiences that may be divergent from our own.

4.2 Setting & Participants

As practicing Black feminists who are committed to the uplift of the Black community [20], we intentionally situate our study at a Youth Community Center (YCC) located in a predominantly Black neighborhood in the Southeastern United States. The YCC's mission is to provide a safe space for disadvantaged children in the community to spend time after school as they work towards becoming healthy, mature adults. This particular predominantly Black neighborhood lacks sufficient economic resources (low socioeconomic status), quality goods (i.e., food dessert) and services, and reportedly has a higher rate of crime. Committed to serving the constituents in this area, the YCC gives special attention to underserved students, most of whom are Black children, and offers resources (e.g., free meals to students, free tutoring, access to computers & the internet, etc.) and services (e.g., assistance with completing college applications and applying for scholarships) to children in surrounding neighborhoods. Graduating from high school and going to college represent significant milestones in the lives of these children since many of them lack economic resources and support for doing so. As a result, Black students are motivated to participate in the afterschool program because continued participation increases the likelihood that they will receive a high school diploma, be able to go to college, eventually attain a college degree and hopefully, move into a higher socioeconomic status. As Black feminists, we resist empirical studies that position Black children as *objects of knowledge*, which are often studied by researchers who lack intimate knowledge of growing up Black in America [20, 60]. Instead, Black students represent *agents of knowledge* who are given the opportunity to voice their thoughts and lived experiences freely [60]. Additionally, we recognize that our study is an extracurricular activity that detracts from the routine afterschool program. Therefore, the degree of participation is entirely up to the student as many of them consistently come to the YCC for educational support (e.g., free tutoring sessions, use of the computer lab, mentoring, etc.).

As part of the recruitment process, one of the researchers, a Black woman, met with students at the YCC to introduce herself and talk about the purpose of the study. After giving parents time to review the details of the study and ask questions, parents signed the IRB consent form and child participants signed the IRB assent form prior to participation in the study. Each student provided their name, grade level, and the affiliated secondary institution at the beginning of the study. Eighty percent (8) of participants identified as girls while the remaining 20% (2) represented boys. All of the participants identified as Black students between grades 5 through 12, with the majority enrolled

Table 1. Participant information

Participant	Gender	Grade Level	Sessions Completed	Conversational agent experience	Sn
Ashleigh	Female	11	7	Siri, Google Assistant	
Anika	Female	10	7	Siri	
Sasha	Female	12	7	Siri	
Destiny	Female	12	4	Siri	
Aliyah	Female	10	2	Siri, Google Home	
Erica	Female	11	1	N/A	
Christine	Female	9	2	Siri, Google Assistant, Alexa	
Jamel	Male	10	4	Siri	
Charlie	Male	9	5	Siri	
Joy	Female	5	4	Siri	

in local high schools. (See Table 1.) Rather than take advantage of our power and privilege as adults (coercing students to participate in our study when they have homework or other obligations), we asked students if they would like to participate before every session, giving them the option to excuse themselves from the design session for that day. This explained why some students only participated once (see Table 1 for details about participation). Each design session consisted of at least five students, with a total of 10 participants across all 7 design sessions. 70% of participants (7 out of 10) attended at least 4 sessions (more than half of the sessions), which indicated that most participants were active in this study. Our participants clearly communicated when they had other obligations or were not interested in engaging in the study that day. In alignment with BFT, which promotes the empowerment of Black children, we did not push them or question their decision to participate since we were appreciative for whatever time students gave us. Instead, we encouraged them to “handle their business” and let us know if they needed assistance. Therefore, it was not unusual for a student to ask for help with a task unrelated to the study (e.g., help with homework assignment), and we assisted them. We initially collected information about prior use of any speech-based interfaces or interactions with conversational agents before engaging participants in design sessions. All participants had access to smart phones and had previous experience with iPhone’s Siri, Android’s Google Assistant, the Google Home device or Amazon’s Alexa. To protect students’ identities while preserving their humanities, we assigned pseudonyms to represent each participant in the study (as shown in Table 1). All participants received an Amazon gift card as compensation for their time.

4.3 Procedure

This exploratory study took place at the YCC over the course of 7 non-consecutive weeks. Each design session was facilitated by two researchers and video recorded for data collection purposes. The sessions were a combination of focus group discussions and design activities, all chosen for their potential to provide insight into Black students’ perspectives on conversational agents. Before each session, a Samsung tablet, equipped with auditory and visual recording capabilities, was set up in the computer lab to record the session. Each design session lasted 30 minutes to 1 hour, with an average session lasting 45 minutes. We adapted multiple design techniques included in the cooperative inquiry method (storyboarding, bags of stuff, and stickies) [33, 37] to better align with Black adolescents’ interests and to remove barriers of entry, enabling them to

contribute as co-designers in the conceptualization phase of conversational agents [60]. Because *BFT* embraces self-definition as an act of empowerment [20], we provided resources to quickly engage Black adolescents in the ideation process of their individually designed conversational agents. Participants were provided with flip charts, sticky notes, writing utensils (pens, pencils, and markers), 28 randomly selected magazines (e.g. Vogue, Essence, Home Improvement, Street & Smith's Basketball, etc.), and additional craft supplies (scissors, glue, paper clips, etc.) to use during the study. The participants also used their personal cell phones for audio recording and demonstrating their use of Apple's IOS Siri or Android's Google Assistant. Each design activity is described below:

Session 1: Focus Group Discussion of Introduction to Conversational Agents. Participants were introduced to the concept of conversational agents and asked to share their experiences using different conversational agents (Apple's IOS Siri, Amazon Alexa, Android's Google Assistant, Google Home, etc.). Students were also asked to critique the conversational agents in terms of likes, dislikes, and suggestions for improving the design of conversational agents.

Session 2: Low Fidelity Prototyping (adaptation of bags of stuff). Indicative of the *BFT* principle *the power of self-definition*, we adapted *bags of stuff* from cooperative inquiry method [33] to give students an opportunity to bring forth their vision of what conversational agents could be. Participants created individual representations of their conversational agent using various materials from the bag of stuff, which included writing utensils, glue, crayons, scissors, play-doh, etc. Researchers explained that the conversational agent could be anything that students envisioned, and they were free to use whichever materials as they saw fit to exemplify their ideas about conversational agents.

Session 3: Vision Board Creation (adaptation of storyboards). Just as *BFT* espouses the power of self-definition [20], we adapted the storyboard design activity from cooperative inquiry method [33] to introduce vision boards where Black students were given the opportunity to define their visions of conversational agents based upon their lived experiences. Extending the design of students' low-fidelity prototypes, participants were given construction paper, magazines, and other art supplies to make vision boards that told the story of their respective conversational agents. Each vision board represented an individual student's concept of a conversational agent, demonstrating its identity, physical appearance (if applicable), voice qualities, knowledge base, including topics of interest and expected knowledge, and its capabilities. Students also provided annotations to explain how their conversational agent would behave in different scenarios.

Sessions 4: Vision Board Walk-throughs. Similar to dialogic interactions, a *BFT* principle that promotes conversation as a way of acknowledging and respecting diverse perspectives of the Black experience [20, 60], each student took turns presenting his/her vision board to peers and researchers while walking through each design element. Students explained details such as the motivation behind naming (or not naming) their conversational agents, their rationale for including specific images, positive affirmations, or choice of topical information. Additionally, researchers and students were encouraged to ask questions for clarification or make comments about vision boards.

Session 5: Focus Group Discussion of Child-Agent Interactions. An extensive period of time passed between design sessions 5 and 6 because the students were on winter break. We engaged students in a discussion about Black holiday traditions (e.g., favorite soul food dishes,

time spent with family members, recent premieres of Black movies, etc.) to reacclimate students to the ideation process of conversational agents, we reintroduced the concept of conversational agents and summarized previous design sessions. The students then used their mobile devices to ask Apple's Siri or Android's Google Assistant pre-selected questions about historical Black people (e.g., Who is Madame C.J. Walker?). These particular social interactions with conversational agents acknowledged the rich historical legacy of Black people and their resiliency despite the ramifications of slavery, another *BFT* principle [20, 60]. Additionally, students were given the opportunity to pose their own requests on their mobile devices, demonstrating topics of interests and typical child-agent interactions. After numerous demonstrations of child-agent interactions with both Apple's Siri and the Android Google Assistant, we engaged the Black students in a lively discussion about breakdowns in communication, inappropriate answers to questions asked and their expectations for what conversational agents should know.

Session 6: Ideation of Design Specifications (adaptation of stickies). Students were asked to review their vision boards created during session 3 and were then provided sticky notes to answer 10 questions about their conversational agent design. Examples of questions included: *Does your conversational agent have a body? If so, what does your conversational look like? Who does your conversational agent sound like? What does your conversational agent know?* Sticky note responses were then read aloud by students to ensure facilitators understood the content.

Session 7: Written Script of Dialogue. In the last design session, students were tasked with writing a dialogue script of an imagined scenario featuring their individual conversational agent. Previously created vision boards, paper and pens were provided to assist students with writing their imaginary scenarios from the point of view of a conversational agent interacting with a user. Next, students role-played their respective scenarios, portraying the role of conversational agent and user in front of their peers and the facilitators. Peers and facilitators provided feedback or suggestions for improvement. Scripts were modified accordingly and each script was later audio recorded by each student on either their mobile device or the Samsung tablet provided by the facilitator.

4.4 Data Collection & Analysis

As a result of students participating in multiple design sessions, we collected data from four primary sources: 1.) video recordings of the 7 design sessions; 2.) vision boards of conversational agents; 3.) students' sticky note responses; and 4.) written scripts of conversational agents' dialogue. We discuss these details below.

Video Recordings of Design Sessions. We captured 338 minutes of video recordings for each of the 7 design sessions, including students participating in the focus group discussions, explaining specific design elements of their vision boards, and roleplaying their written scripts of imaginary dialogue with their respective conversational agents. All video recordings were analyzed by two researchers. First, each researcher independently watched each design session, taking notes about what they observed and heard the students say. Next, researchers met repeatedly to discuss and compare their detailed observational notes, using inductive coding [65] to identify an initial set of 11 emergent themes.

Vision Boards. Two researchers used a series of question to evaluate the design components of 8 students' vision boards, including the physical layout of the vision board, materials used to create the vision board (i.e., choice of magazine, selected images, etc.), topical information

displayed on the vision board, hand-written annotations, and any words or messages featured on the vision board. The series of questions included: "What is the physical layout of the vision board?" "What is the physical representation of the conversational agent?" "What are the capabilities of this conversational agent?" "What kinds of information does this particular conversational agent know?"

Sticky Note Responses. We collected a total of 75 sticky note responses from 9 students. After removing duplicate sticky note responses, we identified a total of 67 sticky notes. Two researchers inductively coded 67 sticky notes to identify 26 emergent themes [65] (i.e., affirmations, tells jokes, life coach, etc.) that categorized students' design specifications for their conversational agents as well as their concerns for interacting with speech-based interfaces (i.e., "always listening," robotic voice, performance issues).

Written Scripts of Conversational Agent Dialogue. Five students wrote individual scripts of dialogue with their respective conversational agents. Next, we recorded students as they engaged in role play to demonstrate their individual scenarios of child-agent interaction. Two researchers summarized each scenario, identifying the intent of the interaction (e.g., positive affirmation) and students' expectations of their conversational agents (i.e., send an email).

In the final phase of data analysis, we cross referenced all four data sources and identified a final set of 37 unique emergent themes after meeting several times to resolve differences and reach a consensus. Unlike reflective thematic analysis [12], BFT, an example of intersectional analysis, centers Black women's experiences as the focal point for analyzing data [20]. Additionally, BFT requires a breakdown of power relations in the context of those who have power, those who do not and how the use of a power disadvantages historically excluded groups [21]. We combined all 37 unique themes into a Google spreadsheet to determine if they were indicative of BFT principles (i.e., power of self-definition) or non-applicable. For example, we merged the themes *Black women celebrities*, *Black actresses* into the unique emergent theme of *conversational agents modeled after Black women*. In comparison, students' comments about Siri's inability to comprehend their spoken requests for information were coded as *performance issues* and deemed non-applicable. Eventually, we were able to identify relationships amongst the emergent themes to derive 7 categories: 1. *conversational agents inspired by Black women*; 2. *conversational agents did not perform as expected*; 3. *ability to custom design conversational agents*; 4. *conversational agents that function as life coaches or personal assistants*; 5. *desired capabilities of conversational agents*; 6. *conversational agents that have knowledge of Black culture*; and 7. *privacy concerns when interacting with conversational agents*.

5 FINDINGS

We conducted this study to gain insight into Black students' use of conversational agents in their daily lives and which capabilities of conversational agents are important to Black youth. We will first address the following research question: *In the context of, their everyday lived experiences, which aspects of Black youth's engagement with speech-based interfaces are prominent and why?*

5.1 Black Youth's Lived Experiences Interacting with Conversational Agents

Black students interact with conversational agents as a way to humor themselves. Some students described using Apple's Siri to make them laugh. This was accomplished by asking Siri to tell a joke or to beatbox. For example, Destiny demonstrated the following interaction with Siri during the focus group discussion:

Destiny: "Hey Siri can you tell me a knock knock joke?"
 Siri: "Knock knock."
 Destiny: Who's there?
 Siri: Britney Spears.
 Destiny: (laughs) "Britney Spears, who?"
 Siri: Knock knock.
 Destiny: "Who is there?"
 Siri: I did it again.
 [Several students laugh]
 Destiny: [laughing] It just wasn't good.

In this example, Siri used the lyrics of pop artist Brittney Spear's song "Oops, I Did It Again" as the source of a joke by literally saying, "I did it again," (a lyric in the song) when she repeats "Knock knock" twice. Interestingly, the Black students were laughing *at* Siri rather than laughing because they thought the joke was funny. In this manner, Siri's monotonous performance served as entertainment, but it also pointed to Black students' desire that conversational agents have the capability of telling jokes effectively, which is based on a sense of timing and delivery. For example, Charlie wrote a clever script in which his conversational agent can effectively tell a "knock-knock" joke while encouraging him to walk out the door so he can be on time for his next appointment. See Figure 1. Such a cleverly written script demonstrated the conversational agent's emotional intelligence and personality, desirable qualities that help to improve the performance of conversational agents.

Sharing knowledge about Siri's capabilities, another student, Aliyah, told us during the focus group discussion that Siri can beatbox. Subsequently, Destiny asked Siri to beatbox which is captured in the excerpt below:

Aliyah : She know how to beatbox too.
 Destiny: [talking to Siri] Beatbox.
 Siri: Here's one I've been practicing, (beatboxes) Boots and cats. Boots and cats and boots and cats... I could do this all day.
 [Several students laugh.]
 Destiny: Is she serious?

Students thought it was funny to listen to Siri beatbox, especially when her performance did not meet students' expectations. We observed the same sense of humor when one student asked Siri to rap the Sugar Hill Gang's *Rapper's Delight*:

Aliyah : Tell her to rap, tell her to rap.
 Destiny: Hey, Siri. Rap.

C: Thanks Nag in my day is same good
 Nag: What a JOKE
 C: yes
 Nag: Knock knock!
 C: Who's There?
 Nag: Normy Lee
 C: Normy Lee who
 Nag: Normy Lee I hate my day Can you let me EN
 C: That was funny
 Nag: You should be waitin out
 C: I am
 Nag: Have a nice day love
 C: Love you more.

Fig. 1. Charlie's written script depicts a conversational agent capable of initiating a joke and leveraging that joke to encourage the user to leave in time for the next appointment.

Siri: Okay, here goes... Apologies in advance to the Sugar Hill Gang. I said hip hop save me from...the peak...

Destiny: The what?

Siri: Hip hop and you don't stop...

Destiny: That's not how that song goes.

Aliyah : She said it's by Sugar Hill Gang.

Destiny: What'd she say? I don't think...What's the name of the song?

Aliyah : I know the words.

Destiny: What song was she singing?

Black students thought Siri was funny because of the way Siri sounded when trying to rap without using rhythm, changing her tone or vocal inflection. The students found humor in Siri's inability to emulate three human capabilities - tell a joke, beatbox and rap. All three capabilities required rhythm, a sense of timing and prosody, none of which are capabilities for existing conversational agents. Furthermore, beatbox and rap represented specific verbal activities that originated in Black culture, and yet conversational agents were not designed to reflect specific aspects of Black culture. Upon reflection of this particular experience, we understood students' laughter to be a form of resistance to the whiteness embedded in Siri's design that disallowed authentic representation of the rhythm, flow and sound so indicative of Black culture.

Black youth desire more natural, human-sounding dialogue with conversational agents that recall past interactions. It is not surprising then this particular group of Black students described how conversational agents “*do not seem real*,” “*are hard to understand*,” and “*talk too slow*.” Conversational agents that sound more like humans would enhance adolescents’ and young children’s interactions with conversational agents, especially when they are seeking information or listening to Siri tell a joke. Students suggested that conversational agents should be designed to be “relatable” and “customizable” with improved speech generation (sound less like a robot). In the following example, two students critiqued Siri:

Joy: “Siri is fake, she is just a voice”

Destiny: “Yea, Siri sounds robotic”

Joy: “Siri is not a real person.”

This particular group of Black students were well aware of Siri’s limitations when it came to intelligently interacting with them. They also disliked that conversational agents were not always capable of understanding what they articulated. This sometimes led to the conversational agent providing incorrect information. Additionally, they expressed consistent dissatisfaction with current voice recognition capabilities and attributed this to Siri not being as intelligent as them. For example, students said the following when describing their experiences using Apple’s Siri:

Joy: She slow sometimes. Siri doesn’t work for me, her dumb self!

Destiny: Siri can’t understand you when you talk too fast.

Joy, a fifth grader who was the youngest participant in this study, expressed frustration that Siri could not understand what she was saying and perceived her to be less intelligent than herself. Her peer, Destiny who was an older student, reminded her to slow down when formulating requests as Siri was incapable of processing young children’s natural language. This specific experience aligned with previous child-agent interaction research in which younger children had difficulties interacting with conversational agents[32, 53]. Furthermore, this particular group of Black students criticized conversational agents’ inability to remember previous conversations, indicating that keeping a history of previous interactions could help conversational agents forge more meaningful connections with all users. Such criticisms highlight that Black students’ experiences with conversational agents lack realism. Consequently, Black students did not feel an emotional connection to Siri because of the robotic voice and lack of memory of previous interactions. For example, Aliyah wanted to have a meaningful conversation with Siri: “Ask me how my day is? Did I have a good day? Something like that.” Anika pointed out that Siri does say, “Good morning” but Aliyah did not consider a greeting to be the same as checking to see how your day had gone. This suggested that Black youth would like to have more human-like conversational agents that not only sound more natural and understand them, but also respond appropriately to the user based on a history of previous conversations. As mentioned previously, these sentiments confirmed Black students seeking human connections with speech-based interfaces that feature conversational agents as being significant for promoting meaningful interactions.

5.2 Race, Gender & Class in the Ideation Process of Conversational Agents

Having explored Black students’ lived experiences interacting with conversational agents, we turn our attention to how race, gender and class influence the design process of their individually

Fig. 2. Sasha's vision board of her conversational agent which reflects her racial identity and affirms positive images of Black people.

designed conversational agents. Our findings address the second research question: *Applying Black feminist epistemology as a critical framework for analysis, what roles do race, gender, and class play in Black students' ideations of their conversational agents?*

Self-definition informs the design of conversational agents that represent Black people and understand Black culture. We gave our students the opportunity to imagine without restrictions their vision of a conversational agent. We provided the students with 28 randomly selected magazines that included *Essence*, *Vogue*, *Home Improvement: Better Homes and Garden*, and *Street & Smith's Basketball Magazine*. Yet, Black students gravitated to the magazines that reflected Black people as they imagined their conversational agents to be representative of Black people and Black culture, indicating that race played a significant role in the ideation of their individually designed conversational agents. Their vision boards featured images of Black women and men of various skin tones, wearing different hairstyles, including natural hair and processed hair, short hair cuts, long tresses, sister locks, and information about Black hair care products and the latest Black fashion. See Figure 2. These Black students envisioned conversational agents that reflected their racial identity, provided positive messages to uplift Black youth (i.e., "When I graduate, you graduate with me."), and possessed knowledge about topics of interest for this group of Black youth (i.e., ranking of basketball teams, taking care of dogs as pets, friendship and relationship advice, etc.). *The power of self-definition* enabled these Black students to oppose racist ideology that negatively depicts Black people in digital media as being savages, criminals, or less human[44], instead creating positive images of Black people as ideal, intelligent and knowledgeable conversational agents while resisting Whiteness as the norm. It was clear that race did matter to these Black students even in the context of designing pervasive speech-based technology. As such, race should never be ignored.

Self-definition accommodated the design of conversational agents that reflected diverse racial and gender identities. While Black students understood the importance of seeing people who look like them and were knowledgeable of Black culture, all of the students' vision boards demonstrated some element of custom designed conversational agents to accommodate the inclusion of both Black and non-Black people, suggesting that everyone should have the ability to

Fig. 3. Christine's conversational agent reflects a mirror image of the user.

select the racial and gender identity of their conversational agents as they see fit. Custom-designed conversational agents that represented different racial and gender identities was a dominant theme for these students. Likewise, students expressed different viewpoints for how to accommodate this design feature. For example, Christine's vision board portrayed the conversational agent as a mirror that reflected the individual user's physical appearance, thus making room for diverse representations of racial and gender identities. See Figure 3.

From an intersectional perspective of race, gender, and class, both Black girls and boys in our study appreciated women of color, especially Black women, as ideal models for designing conversational agents. On the surface, this seemed insignificant since 8 of the 10 participants in our study were Black girls. However, both Black boys in our study modeled their conversational agents after women of color. One Black boy, Charlie, described his rationale for modeling his agent after the Black actress Taraji P. Henson: "If I could name my Siri, I want Taraji P. Henson. She's my role model." He used the Black lexicon "ghetto fabulous" to describe Taraji P. Henson's character Cookie Lyon on the popular Black show "Empire," making it clear that Cookie Lyon was no pushover and demanded respect despite having served 17 years in jail. His admiration of Cookie Lyon as a survivor and creative musical business mogul testified to Black women's resiliency and strength despite personal setbacks or societal barriers that challenge the humanity of Black women[20, 22]. Charlie also admired Taraji P. Henson because of her personality and celebrity status in society, both of which inspired him to create a conversational agent that would help him "be famous and make money." Ideas such as this point to the intersection of race, gender and class and its influence in the design of technology. As a result of modeling his conversational agent after Taraji P. Henson, a successful, famous, and wealthy Black woman, Charlie imagined

a life for himself beyond his current socio-economic status in society, recognizing the role that technology could play in supporting this aspiration.

In comparison, the other Black teenage boy, Jamel, created a vision board that displayed women of color, the biracial actress Zendaya and the Black actress Storm Reid, as options for the physical interface for his conversational agent. Jamel preferred to “talk to no dudes,” choosing the young, biracial actress Zendaya as his first choice for the physical representation of his conversational agent, acknowledging that he found her to be attractive. The design of his conversational agent as a biracial woman of color reflected the intersection of his gender identity (male) and sexual orientation (heterosexual). Both Black boys’ vision boards validated not only the intersectional experiences of women of color, but their own intersectional identities of race, class, gender and sexuality.

We also witnessed the appreciation of Black women’s lived experiences in the Black girls’ ideations of conversational agents as evident in their vision boards. Two Black girls also named Black female celebrities, singer/actress Beyonce and comedian Tiffany Haddish, as their role models, indicating that popular Black women entertainers were deserving of their respect and admiration for their many accomplishments. Their decision to model their conversational agents after Black women emphasized a collective Black girls’ standpoint. During these focus group discussions, Black girls were in awe of successful Black women and perceived them to be formidable role models. One Black girl, Joy, described her vision board as being a conversational agent that “looks like a Black woman,” and resembled the Black actress Naturi Naughton, including a quote from Yves Saint Laurent that talked about beautiful Black women:

Yves Saint Laurent: The beauty of Black women is so much more beautiful. The Black body...there’s something finished, perfect, about it. She is like a sculpture...a shape that you embellish. [as quoted in Vogue November 2019 magazine]

Joy, the youngest participant in this study, thought this quote captured her opinion of Black women’s beauty. Other Black girls also felt the need to affirm their individual beauty and self-worth, purposefully designing their conversational agents to articulate positive messages about Black girls:

Ashleigh: Never again will I dim my light for anything or anyone.
Sasha: You are very beautiful. [referring to positive messages that her conversational agent tells her]

The quotes displayed on Black girls’ vision boards demonstrated their admiration for Black women, whether in terms of physical beauty or otherwise, inspiring these Black girls to ideate technology embedded with the positive qualities of Black women.

However, not all students chose to model their conversational agents after Black women celebrities. For example, one particular Black girl (Ashleigh) modeled her conversational agent after her grandmother and her real-life mentor, also a Black woman, who helped her to “find her sense of self,” an example of the Black feminist thought concept of othermothering[20]. Ashleigh expressed wanting her agent’s voice to invoke the same kind of emotional support that she received from her mentor and grandmother. She liked the idea of her grandmother talking in her ear and offering positive messages that affirmed her identity as a Black girl on the cusp of Black womanhood. For

Fig. 4. Written script demonstrating how a conversational agent positively affirms the user when the user is sad.

this particular young Black girl, her conversational agent did not need a body because it was more important that the agent represent an extension of herself, a stream of consciousness that encouraged her through tough times, pushed her to overcome obstacles and reminded her of her career aspirations. The emotional support provided from her conversational agent's ability to emulate her grandmother's voice helped her to envision a conversational agent that could "show her [the path] to fame" as a means of elevating her current social status in society. These students imagined conversational agents modeled after positive, capable Black women that could help them be the best versions of themselves, a stark contrast to the perception of Black women in today's society.

Moving beyond race, gender and class, Black students imagined conversational agents that functioned as life coaches and personal assistants. Black youth wanted a conversational agent capable of helping them with their self-care. For example, Destiny said that she wanted her conversational agent "to help me manifest great things in life." We refer to these innately positive qualities as those indicative of a *life coach*. Words such as "compassionate" and "caring" were used to describe the personas of these imagined conversational agents. Vision boards contained suggestions that conversational agents initiate greetings and affirm their users with phrases like "Good morning," "Can't is not a word in my vocabulary," and "It's about what you need, sis." Ashleigh conceived of her conversational agent as being an extension of self that helped her to make good decisions that moved her towards her career aspirations. In this way, conversational agents evolved into *digital othermothers* who helped Black girls embark on the "journey to find self" [20], holding

them accountable for becoming their best selves. See Ashleigh's written script (Figure 4) which depicted an imaginary conversational agent who encouraged her to get out of her depressive state by reminding her how wonderful she was.

In addition to the role of *life coach*, students imagined a conversational agent that functioned as a *personal assistant*. Black students repeated the notion that conversational agents were meant to help and care for their users. As noted on several sticky note responses (i.e., "Gives helpful info", "They can help me with my problems," etc.), students echoed appreciating conversational agents' administrative capabilities. This notion of helpfulness was one of the functionalities that already existed in current conversational agent technology. Conversational agents capable of aiding them with self-care also reflected the responsibilities of a personal assistant. However, students differed in their ideas about the kinds of self-care information that conversational agents need to know. For example, Christine created a vision board (Figure 3) depicting a mirror as a conversational agent who was able to be "an uplifter when it heard negative or mean comments" as the user looks at their mirror image, thereby helping them to construct a positive self-image for themselves. This same mirror would listen to the challenges that Black women encountered trying to maintain healthy hair and suggest Black hair products and a regimen to help Black women take care and style their hair.

As previously mentioned, the theme of custom-designed features was consistently found throughout the designs of students' individual conversational agents and revealed personalization as a necessary design element. For example, Charlie used the word "xclusive" to encapsulate the idea of his conversational agent. His intentional misspelling of *exclusive* drew attention to how Charlie wanted his conversational agent to be "special to the user" and therefore, unlike any other design because of its user-defined features. Each student personalized their conversational agents by giving them names (i.e., *Katrina*, *Miss Nae*, *Suzie*, *April*, *ZZ*, etc.). The ability to personalize the design of their conversational agents suggested a personal and emotional investment in having an intimate relationship with their respective conversational agents.

Black students' ideations depicted conversational agents as possessing a high level of Artificial Intelligence (AI). AI capabilities would be used to parse Black children's spoken language, culturally relate to and engage in genuine conversations with Black students. When asked to give one word to describe their conversational agent, Joy articulated the word "omnipresent." She wanted her conversational agent to be accessible everywhere she went and to know everything, including intimate details of life (e.g., what she likes). Besides knowing facts about the world, Black students desired a conversational agent that deeply understood them and possessed intimate knowledge about life goals, hobbies, personal interests and career aspirations. In addition, the conversational agent needed to have a sense of an individual's physical appearance to suggest complimentary hairstyles and outfits to wear on a daily basis. Additionally, Black students expressed wanting to carry on a meaningful conversation with their conversational agent and imagined their conversational agent asking them how their day went and having prior conversation recall to refer to previous topics they had discussed with their conversational agent. In summary, they wanted a conversational agent that has depth, all of which goes beyond the capabilities of conversational agents as we know them today.

5.3 How Speech-based Interfaces Perpetuate Racism

Acknowledging that issues of race and racism are largely ignored within the CSCW community, we find it necessary to turn a critical eye towards how specific technologies can be used to oppress Black people. We analyzed all four data sets to address our final research question: *In the context of Black students' lived experiences, in what ways (if any) do speech-based interfaces perpetuate racism?*

Speech-based interfaces reflected whiteness as the design default. Just as Black feminist thought centers the experiences of Black women, most Black students centered the design of their conversational agents around Black women. For example, Sasha, a Black girl, chose mostly images of Black women - 22 images of Black women versus 3 images of Black men, to represent potential physical representations of her conversational agent. Sasha defied this notion of Whiteness as being the design default when she modeled her conversational agent to look like Black people. At the same time, she applied a more inclusive design practice by including a design option in which the user chooses the physical attributes (i.e., race, gender preference, skin tone, hair style, voice qualities, etc.) of his/her conversational agent. See Figure 2. This was in stark contrast to how conversational agents are typically designed to reflect Whiteness as the norm with no ability to customize their personas (i.e., use of Black language in their speech) as being indicative of Black people. As mentioned previously, Christine's vision board resembled a mirror which reflected the user's physical appearance while Sasha's vision board featured Black people of different gender and skin tones, wearing a variety of hairstyles and dressed in different types of clothing. The multiplicity of ideas presented in these two Black girls' vision board exemplifies the Black feminist thought principle of *diverse responses to common challenges in Black feminism*, the challenge being the appreciation and representation of the diversity of Black women's bodies. Resisting the notion of whiteness as the design default, Sasha and Christine shared two different perspectives of centering Blackness in their conceptualizations of conversational agents.

During the course of students presenting their vision boards, the issues of race and racism came up. We closely scrutinized the following exchange between the facilitator and three Black students:

Facilitator: [commenting on Sasha's vision board] There are no White people on there.
 Charlie: [criticizing Sasha] Don't be racist.
 Anika: You don't know the real definition of racism. I'm going to need you to shhh.

The facilitator noticed that Sasha's vision board did not include images of White people. In response to this observation, Charlie accused Sasha of being racist for not including images of White people on her vision board. However, Anika disagreed with Charlie's critique because she understood what racism was and how the lack of White people displayed on Sasha's vision board was not an indication of racism. Sasha enabled users to select the race, gender, and other physical features for their custom-designed conversational agent, excluding no specific racial group. Later, we learned during a focus group discussion that Sasha's conversational agent is actually named after her White female classmate ("Suzie") despite the physical representations of Black people displayed on her vision board. It became evident that Sasha intentionally positioned Blackness as the default value which resisted the notion of Whiteness as the normative design practice, enabling Black people to see themselves as possible design options in the context of speech-based interfaces that feature conversational agents. The previous conversational exchange between the facilitator and students demonstrated Black youth's dual awareness of the lack of Black representation as a common technology design practice and the need for more inclusive design practices (e.g., customization

of conversational agents) to accommodate different racial groups of people. Based upon their lived experiences, Black youth perceived Whiteness as the design norm of current speech-based interfaces that featured conversational agents, thus rendering Black people as an invisible user population. In this manner, speech-based interfaces perpetuate anti-Blackness and reinforce racism in technology that was not intentionally designed for Black consumers.

Speech-based interfaces that feature conversational agents had difficulty recognizing and understanding Black language. Black students repeatedly described experiences in which conversational agent technology did not understand Black language, specifically lexicon or vocabulary attributed to Black language[4]. For example, one student, Aliyah, demonstrated her frustration with the inability of Apple's Siri to comprehend her request for information:

Aliyah : Hey, Siri. Who is MLK?

[Siri does not respond.]

Aliyah : [visibly frustrated now] Hey, Siri! Who is MLK??!!

MLK, an example of Black lexicon, refers to the civil rights leader Dr. Martin Luther King, Jr., the abbreviated name which is commonly used within the Black community. Though every major city in the U.S. has a street named *Martin Luther King Jr.*, Siri appears to have no knowledge of this abbreviated moniker bestowed by the Black community on an internationally known and revered Black historical figure. Consequently, Siri cannot process Aliyah's request. Interactions such as these exemplify oppressive design practices in which search algorithms are intentionally designed to not comprehend Black language, an example of anti-Black linguistic racism[2, 4, 55]. In the U.S., White Mainstream English is the preferred language of choice for speech-based interfaces, a choice that disadvantages Black language speakers as being "linguistically, intellectually, and morally inferior"[4, pg 2]. The insensitivity of conversational agents to recognize and process Black language as a legitimate language with its own syntax, phonology, morphology and lexicon testifies to anti-Black linguistic racism that informs the design of speech-based interfaces[4]. Consequently, Black students have learned to adapt to speech-based interfaces that only recognize White Mainstream English, often modifying their use of language:

Aliyah : Who is in charge of the Underground Railroad?

Siri: I don't have that information on the Underground Railroad.

Aliyah : Who is in charge of the Underground Railroad?

Destiny: Hey, Siri. Who is in charge of the underground railroad? (stumbling over the word *charge*) Siri may not respond because I messed up the question.

Siri: [no response]

Destiny: Hey, Siri. Who is in charge of the underground railroad?

Siri: I didn't get that.

Destiny: She didn't get that.

Facilitator: She didn't get that? Ask who is the conductor. Ask who was the conductor of the Underground Railroad.

Destiny: Hey, Siri. Who was the conductor of the Underground Railroad?

Siri: Here's an answer from history.com. Harriet Tubman is the most famous conductor of the...

Siri finally replies with accurate information but only after several attempts to reformulate the question. Siri clearly struggles with recognizing the nuanced "Who is in charge of the underground

railroad?" as the equivalent to "Who is the conductor of the underground railroad?" Harriet Tubman is credited as being the most successful conductor of the underground railroad, a secret networked passageway that enabled numerous Black Americans to escape slavery in the south and travel north to find freedom[1]. Black history and culture depicts Harriet Tubman as being in charge of the underground railroad, a Black woman, a *she-ro*, who traveled the most miles and successfully transported the most slaves to freedom, which explains why she is the most celebrated conductor[1]. However, Siri's search algorithm is ignorant of this characterization of Harriet Tubman as being a Black woman in charge of the underground railroad. This raises the pertinent question as to how are search algorithms designed to find and cross reference accurate information about Black people and other racial groups? For Black Americans, Siri's difficulty in recognizing the resiliency, strength and leadership abilities of Black women such as Harriet Tubman is yet another example of anti-Blackness embedded in the design of such conversational agents. Obviously, the corpus of data used to train Siri lacks adequate information and details that reflect the rich historical legacy of Black people in the U.S., another example of how speech-based interfaces perpetuate racism.

Speech-based technologies enabled the surveillance of Black youth. Lastly, we found that the older Black students were aware of being surveilled by their phones and they did not like it. Specifically, these Black students disliked when their phones "heard words" that they said as part of an ongoing conversation with a peer and then displayed advertisements about related topics, infringing on their right to privacy. For example, Ashleigh mentioned that when she was talking to her mentor about pressing issues that troubled her, the "Sprinkle of Jesus" mobile application, not indicative of a conversational agent, would "send her a quote related to what she is going through," minutes after listening in on what she thought was a private conversation. Ashleigh later referred to the act of mobile applications listening to her private conversations and sending her unsolicited quotes as being synonymous with stalking. Destiny echoed this same feeling of being surveilled by her mobile device when she said: "You know she got a camera and she be looking." ("She" referred to Apple's Siri.) Knowing that they were constantly under the surveillance of speech-based interfaces, these students re-imagined conversational agents that leveraged familiarity with users to create intimate relationships based on knowledge of users' personal goals, career inspirations and hobbies, foregoing the role of stalker. Black students wanted more control over speech-based interfaces, so that they would not be "stalked" but, instead, would be listened to and supported by the technology that they allow into their daily lives.

The act of surveillance is nothing new for Black people in the United States as history shows that Black people have not enjoyed the same privileges and freedom as White people[21, 26]. Rather, legislation such as Jim Crow laws have been enforced to restrict the movement of Black bodies in the United States[26]. Case in point is the discontinued racist practice of Black Americans having to present papers to White people when traveling in the North as proof that they were not escaped slaves running from the inhumanity of slavery[26]. While Black Americans do not need to present "papers" today, they are still being surveilled as they navigate racks of clothing in department stores, walk up and down aisles in grocery stores or work late hours in office buildings for fear of stealing, shoplifting or breaking into secure places[47]. Furthermore, the surveillance of Black bodies is still a prevalent issue in America today as evidenced by the continued surveillance that results in more Black people dying at the hands of police brutality. This speaks to the subtle yet racist message that Black bodies must be surveilled. In fairness, these speech-based technologies listen to all users, regardless of race. However, for Black Americans, this subtle yet heinous act reinforces the racist message that Black people are less than human beings and non-deserving of privacy.

6 DISCUSSION

As Black feminists in the HCI community, we seek social justice for Black children, creating counter narratives that center their experiences and uplift the Black community. While Blackness represents the current trend in U.S. news, our commitment to serve the Black community goes beyond conducting research of yet another historically excluded group or publishing papers in reputable venues to achieve academic recognition[27]. It means challenging the status quo and holding the field of HCI accountable for how we address race and racism in the design of technology. We present three takeaways that push the field of HCI towards adopting anti-racist design practices that affirm Black people's humanity.

6.1 Black Matriarchs as Conversational Agents

Many speech-based interfaces featuring conversational agents, such as Siri, are considered feminized digital assistants [10]. The feminization of these conversational agents can be attributed to the patriarchal biases of the designers of this prevalent technology. Bergen [10] suggests that the gendering of such technologies serves the purpose of gaining the trust of users, users who come to rely on this technology to contain their private information. Once their trust is gained, users are then made vulnerable to the surveillance of their devices. However, in our study, the gendering of these conversational agents as women, specifically Black women, comes from a place of power and respect rather than patriarchal oppression [20]. Black women in the U.S. have earned a place of respect and power as matriarchs in their respective families and communities. Not having the option of only being homemakers or stay-at-home wives, Black women have worked outside of the home since slavery [20, 41]. Oftentimes, Black women function as the head of the household as single parents (never married or divorced), or share responsibilities and decision-making with their spouses. As respected matriarchs in the Black community, Black women such as Fannie Lou Hamer, Rosa Parks, Ella Baker, etc. have lead the fight for civil rights for Black people [20, 64]. These Black youth modeled their conversational agents after Black women because of the power and positive influence that real Black women have in their lives. They look up to and see themselves in these Black women. An imagined conversational agent that embodies the strength and resiliency of Black women represents a stark contrast to Bergen's [10] notion that the feminization of this technology reflects the negative stereotype of females as fragile and incompetent which is detrimental to its users.

6.2 Intentionally Engaging Black Children in Design Futuring

In the context of the HCI literature, the lack of information regarding children's racial identity speaks to the negligent yet racist design practice in which those who are White and privileged control the narrative about who gets to design technology and for whom. Because racial identity is often ignored in HCI research, scant attention is given to understanding Black children's interactions with technology or their motivations for using technology [3] and even less research positions Black children as designers of technology [11, 39, 50, 67, 71]. Applying social justice design as a critical lens, Dombrowski et al. [28] posit that the act of recognition serves as the solution to the lack of acknowledgement or the invisibility that historically excluded populations such as Black Americans often experience. As a result, the HCI community is largely uninformed of Black design perspectives such as BFT, missing an opportunity to expand theoretical design approaches that

subsequently include Black people's contributions to the field of HCI. Additionally, Black scholars have long been in the trenches, doing the work and advocating for Black children to be producers of technology rather than mere participants performing at the pleasure of "White gaze" [38]. Currently, CSCW research upholds whiteness as the normative design default and preferred consumer base. It also renders Black children as non-existent producers with very little research that affirms their ideas, their self-worth or humanity. In protest of these racist practices that render Black people as invisible in the field of HCI, we caution our fellow colleagues to not exploit Black children as a research commodity but to invest in their intellectual development while affirming their racial and cultural identities and acknowledging the historical ramifications of racism. We argue that Black children are innovators, dreamers, capable of futuring and represent the next generation of technologists. Therefore, they should be positioned as such in research which examines how Black children conceive and use technology.

As Black feminist technologists who leverage both our identity and scholarly pursuits to give back to their communities, we oppose "the rhetorical narrative of 'Whiteness as normality' [13] and challenge the misconception that Blacks have no place in techno societies. Our research goals are to align our approach with afrofuturism, a different alternative for imagining a future in which Black people leverage our history, culture and political agenda to inform the design of innovative technologies to create a more just society while increasing our economic development [74]. Findings from our study reveal that Black youth imagine a world in which technology creates equitable learning environments where their racial identity, culture and language are viewed as assets rather than deficits. As *community othermothers*, we remain actively engaged with the local YCC because we understand the significance of creating opportunities for Black children to be innovators of technology and to imagine a world in which the use of technology creates a level playing field for all students.

6.3 Resisting Anti-Black Linguistic Racism

As noted in the example where Siri did not recognize *MLK* as the abbreviated name for Dr. Martin Luther King, Jr., many speech-based interfaces do not accommodate Black language speakers. This exemplifies anti-Black linguistic racism which values White Mainstream English at the expense of Black people's humanity [4, 5]. Black scholars who advocate for equity in education on behalf of Black children offer a different perspective of how White Mainstream English becomes a force of oppression inflicted on Black people. Alim & Smitherman explain this phenomenon:

"Whites can exercise power through overt (obvious) and covert (hidden) racist practices. The fact that it is the language and communicative norms of those in power, in any society, that tend to be labeled as "standard," "official," "normal," "appropriate," "respectful," and so on, often goes unrecognized, particularly by the members of the dominant group...White Mainstream English and White ways of speaking become the invisible—or better, inaudible—norms of what educators and uncritical scholars like to call academic English, the language of school, the language of power, or communicating in academic settings." [2, p. 171]

This quote makes salient the power of language, specifically White Mainstream English, since it is the "standard" language which dominates both public and private K-12 education, the ivory tower, corporate boardrooms and even ubiquitous technologies such as speech-based interfaces that

permeate our daily lives. Less dominant social groups are pressured to assimilate into White culture, including learning "correct English" as an indicator of being properly educated and a predictor of success in American society. The premise is that learning how to speak White Mainstream English and communicate accordingly inoculates less dominant groups from racism and is an absolute prerequisite for success. Failure to do so results in limited economic growth and opportunities. However, history proves this ideology to be false as educated Black Americans, some educated at reputable White institutions, have suffered unemployment, experienced racial profiling while driving their luxury sedans, and have died at the hands of police while using "standard" English to beg for their lives. The problem lies in the fallacy that Black language speakers must deny their native tongue, disavow their identity, in order to be accepted by a predominantly White society that devalues Blackness. Such a proposition creates the very conditions that dictate White Mainstream English as being superior to Black language, a racist ideology used to oppress Black people.

As responsible Black feminist technologists, we find it necessary to say that not all Black people identify as Black language speakers, and just as Black feminist thought recognizes the heterogeneity of languages spoken among the Black community, we also support the Black people's diverse usage of language expression. Our commitment is to more inclusive design practices that embrace the diversity of the user population, including the often overlooked population of Black people as technology consumers. However, as *community othermothers* who are heavily invested in the holistic development of Black children, we cannot remain silent about the anti-Black messages that are conveyed to Black children, in particular children who are Black language speakers. This may seem radical for those who are firm believers in speaking "correct English," but critical education research shows that Black children who are the recipients of microaggressions internalize and eventually accept these negative messages about their self-identity, their self-worth, and their ability to succeed, all of which contribute to a false sense of inferiority, low self-confidence, self-hate, poor academic performance, and apathy in the classroom setting [42, 45, 48, 49, 54, 57]. We, as Black feminists who willingly accept our role as *community othermothers* who protect Black children, cannot be silent and condone the abuse and mistreatment of Black children, nor can we allow others to continue this vicious cycle of oppression which robs Black youth of their future.

From a Black feminist thought perspective, it is imperative that we purposefully design pervasive technologies such as speech-based interfaces used by millions of Black people to de-center White Mainstream English which emphasizes White privilege and power at the expense of dehumanizing Black language speakers (and other non-White Mainstream English speakers). As socially conscious researchers, we need to question for whom are these speech-based interfaces designed and who defines the search algorithms for such technologies? What role do Black people play in the design of speech-based interfaces? How do these search algorithms find culturally nuanced information that accurately reflects Black Americans' rich history, culture, language and other issues of concern? If Black people are not adequately represented and seated at the table when these technologies are being conceived, then how can we as a community of scholars ensure that the design of these pervasive technologies does not reflect anti-Blackness or perpetuate racism? As a community of scholars, we can no longer turn a blind eye to racism within the field of HCI.

6.4 Limitations of the Study

As Black feminists, we are socially conscious of our responsibility to uplift the Black community and leverage our position and privilege as scholars to conduct research that emphasizes Black people's

experiences with technology [20]. Even in this context, we acknowledge the power differential that exists between us as privileged researchers and Black children. Because of this power differential, we intentionally empower Black youth by engaging them in dialogic interactions to elicit their perspectives and ensure that their voices are heard [21, 60]. As researchers who are committed to social justice, we engage in self-reflection about our research agenda, our biases and how the combination of the two influence the research activities and results. For example, despite our attempts to empower participants, we realize that some of the children may have been intimidated by our authority as adults and consequently, may not have been transparent about their experiences with conversational agents or the motivations for their design ideas. Additionally, the seven design sessions took place over non-consecutive weeks due to previously scheduled after-school activities and holiday observances. The breaks between sessions (e.g., vision boards vs. design specs) seemed to confirm students' initial ideas about their conversational agents since students were given the option of modifying their vision boards in subsequent design sessions. Instead of changing the physical appearance or embodiment of their ideations, students spent more time thinking about the desired capabilities of their individual conversational agents. Of course, it is possible that students could have been reluctant to modify their designs. Finally, though the majority of students (70%) participated in four or more design sessions, three students (30%) were only able to complete one or two design activities. Competing responsibilities (e.g., tutoring, band practice, etc.) prohibited some students, especially those with lowest number of attendance, from participating in all 7 design sessions. Despite these shortcomings, we collected and analyzed data from all 10 participants.

7 CONCLUSION

Issues such as race and racism have largely been ignored within the CSCW and HCI communities [34, 56, 69], and yet current design practices are embedded with implicit biases that uphold the social construct of whiteness as the dominant racial group in our society [63]. As a call to action, we call upon scholars in both CSCW and HCI who care deeply about social justice to embrace alternative social theories that bring to light the experiences of historically excluded groups. As Black scholars, we demonstrate one approach for accomplishing this goal, embracing Black feminist epistemology as a critical framework that centers the experiences of Black youth as they engage with speech-based interfaces in an attempt to engage our audience in a long, overdue discussion about how race and ultimately, racism influence how technology is designed and for whom. Our findings indicate that current speech-based technologies are flawed in their design as they uphold whiteness (i.e., White Mainstream English as the preferred language choice) and convey anti-Black racist messages that negatively impact Black youth's sense of self, racial identity and their humanity. As Black feminist technologists, we advocate for more equitable design practices that affirm the historical legacy and rich culture of Black people as invaluable assets in this technology-driven era and position Black youth to be inventors, innovators and producers of technology. Such acts of resistance help to create a more equitable and just society, not only for Black people, but for everyone.

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