Archaeology of Self: Reflexivity in Data Activism to Address Systemic Injustices

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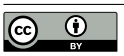
Abstract

Traditional data science education often neglects the importance of identity and sociopolitical context—especially for African American students whose lived experiences and cultural insights are essential for building justice centered technologies. This paper presents findings from the Data Activism Program, which integrated Dr. Yolanda Sealey-Ruiz's Archaeology of Self™ framework to foster critical self-reflection and racial identity development among African American high school and college students. Through technical training in data science, art-based learning, and partnerships with social justice organizations, students engaged in reflexive practices that positioned them as active agents in challenging systemic oppression. Interviews reveal that the Archaeology of Self™ deepened students' reflexivity skills and strengthened their sound racial identity, enabling them to interrogate bias within themselves and the data science process. We argue that embedding frameworks such as the Archaeology of Self™ into algorithmic design offers a concrete, transferable method for operationalizing reflexivity in data science and AI. This study contributes to the AI and data science community by offering actionable strategies to center identity and power in AI development.

CCS Concepts

• **Human-centered computing** → **Empirical studies in HCI**; • **Social and professional topics** → *Informal education*; *Cultural characteristics*; • **Applied computing** → *Collaborative learning*.



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Keywords

Responsible AI, data activism, liberatory computing education, participatory AI, reflexivity, Archaeology of Self™

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1 INTRODUCTION

Traditional data science education rarely encourages students to reflect on their identities, experiences, or social positions, yet such practices are essential for African American students to cultivate a strong and affirming racial identity[49, 77, 82]. Nor does data science education empower students to reflect on how AI bias might affect themselves or their communities negatively[81, 92]. Without these opportunities for self-exploration, computing curricula often uphold dominant, race-neutral frameworks that ignore the sociopolitical contexts in which knowledge and technology are produced [55, 66]. While prior research has highlighted the effectiveness of Responsible AI curricula in both educational and professional settings, there remains limited exploration into how people develop the skills to interrogate their own biases during the data science and AI development process[10, 32, 52, 57]. One way to foster the development of more inclusive technology is by introducing data scientists to the Archaeology of Self™(AOS), a framework and terminology developed by education scholar, Dr. Yolanda Sealey-Ruiz [74]. This framework invites individuals to engage in a thorough process of self-excavation, systematically uncovering and reflecting on how issues of race, class, religion, gender, and sexual orientation are embedded within their identities[74].

To advance this work, we integrated the Archaeology of Self™ framework into our curriculum for African-American high school and college students, ensuring that students learn how to use it to challenge systemic racism in data science, and to strengthen their racial identity holistically [90]. This Archaeology of Self™ mitigates AI's potential to amplify racism, confronting the misconception that diverse computing teams are unnecessary, and addressing the false belief that minoritized communities and youth cannot make meaningful contributions to the data science development process.

This study is part of a broader research initiative that explores how African American youth can be trained, supported, and empowered as data scientists[90]. Through the Data Activism Program, high school and college students build proficiency in the popular programming language, Python, and the data analysis library, Pandas. They use these aforementioned skills to create data visualizations that highlight inequities within their communities, collaborating with social justice organizations to address systemic oppression[89, 90]. These community partners played a central role in highlighting the value of the Archaeology of Self™ for data scientists and advocating for its integration: Algorithmic Justice League, Vera Institute of Justice, AfroPink, and Sea Grant. Professionals working in research organizations, non-profits, and community groups validated the students' work, ensuring its quality and relevance to community needs. With experience using and developing AI and using data science in their daily work, they bring a systems-level lens to advancing justice.

As students participated in the data activism lessons and interviews, we conducted research to evaluate the impact of these activities. One core learning outcome of the class was to strengthen students' sound racial identity, which includes acknowledging race as a significant aspect of personal identity(high centrality), fostering a positive attitude toward one's racial group(high private regard), and recognizing and addressing the adverse societal attitudes directed at that group(low public regard)[31].

The overarching project asked: *How are African American youth engaging in data activism?* In this paper, we build on that foundation by examining a more specific dimension of this work. The central research questions of our study are:

(1) To what extent does the Archaeology of Self™ framework promote student reflexivity and support the development of a sound racial identity?
(2) How does heightened reflexivity and a strengthened sound racial identity shape students' engagement with data activism?

Our objective was to explore how minoritized youth engage in self-reflection and challenge bias throughout the data science development process. This study analyzes the impact of the Archaeology of Self™ framework, which we implemented in the Data Activism Program to guide students—many of whom had not previously been trained to critically assess their own biases—through intentional reflexive practices.

Interviews revealed two main findings:

(1) Strengthened Sound Racial Identity: Students reported growth across all three components of a sound racial identity(higher private regard, increased racial centrality, and greater awareness of low public regard).
(2) The AOS Led to Interrogating Systemic Injustice in Data Activism: Students were able to clearly articulate how their racial identity as African Americans influenced their approach to their data activism projects. They identified specific moments when they questioned their assumptions or internalized biases, illustrating how reflexivity can shape technical decisions.

We propose the Data Activism Program as a concrete, transferable framework for embedding reflexivity into algorithmic design, responding to data science and AI scholars' calls for actionable methods to examine power, bias, and positionality in participatory AI[21, 24, 25, 72, 80]. While youth interact with AI daily, they are rarely included in its creation[64, 92]. Our work centers minoritized youth as critical architects of just technological futures. Justice demands embedding the voices and worldviews of minoritized communities at every stage of the data science and AI development process[25, 37, 60, 64, 92]. The Archaeology of Self™ framework, central to the Data Activism Program curriculum, offers a path toward that vision, grounded in reflexivity. The findings offer actionable insights for data activism, particularly in training AI developers to center justice, identity, and power in their technical practice.

2 RELATED WORK

2.1 Archaeology of Self™ and Liberatory Computing for Data Activism

Data scientists and AI practitioners cannot effectively address algorithmic bias or equitably collaborate with minoritized communities without first examining their own positionality[15, 25, 43]. One pathway into this necessary introspection is the Archaeology of Self™ framework, developed by Yolanda Sealey-Ruiz, which guides individuals through a layered excavation of personal and collective racial bias [53, 74]. Its three foundational principles—questioning assumptions, engaging in critical conversations, and practicing reflexivity—anchor a structured process for surfacing deeply embedded beliefs about race and identity. As a key element of Sealey-Ruiz's Racial Literacy Development Model (RLDM), the Archaeology of Self™ offers a practical framework for cultivating the reflexive habits needed to design inclusive technologies.

The visual structure of the model illustrates an excavation that begins with interruption and proceeds through historical literacy, critical reflection, critical humility, and ultimately, critical love(see Fig.1 in Appendix 1). Central to this model is the idea that reflexivity is not a one-time achievement but a continuous process of learning, unlearning, and relational accountability. Sealey-Ruiz's eight-step method, which includes journaling, self-reflection, and integrating awareness into everyday practice, offers concrete methods for maintaining this reflexivity over time [74]. This call for sustained interrogation of assumptions prepares us for a broader discussion of how critical love must accompany technical interventions.

Shamari K. Reid expands on this foundation by emphasizing "critical love" as essential for dismantling systemic injustices, arguing that technical knowledge must be coupled with emotional and relational transformation [68]. This perspective points us toward frameworks in computing education that demand a liberation-focused approach in the values and relationships that shape how technology is taught and practiced. Our work aligns with the advocacy of

Yolanda Rankins, Sepehr Vakil, and Amy J. Ko for justice-oriented interventions in computing pedagogy [47, 48, 67, 87, 88]. Several scholars in the computing community move beyond surface-level inclusion to critically examine and address the deeper power dynamics embedded in the field[1, 5, 18, 19, 28, 30, 40].

These calls for structural transformation are echoed in the broader AI ethics community, where efforts to reduce bias have led to tools such as Model Cards, Datasheets for Datasets, and the Data Nutrition Project[36, 41, 54]. While valuable, such tools often emphasize surface-level documentation without addressing the deeper biases and assumptions that shape data and models [12, 29]. Recent research suggests these tools must be paired with critical self-reflection: the internal examination of one's own values, positionality, and design assumptions [12, 15, 72].

To address this need, we draw on recent work in AI ethics and Human-Computer Interaction (HCI) that center reflexivity and minoritized communities as core components of justice-oriented design [15, 21, 22, 24, 42, 61]. These perspectives stress that understanding one's identity and its relation to power is essential, but not sufficient. Reflexivity must be expanded to include how power imbalances shape developer–stakeholder dynamics [15, 28]. Our work responds by integrating intersectionality, discriminatory design, and student-led critique into reflexivity, positioning students not just as learners, but as experts of their own lived experiences [8, 70]. This positions our contribution within the lineage of critical scholars such as Ruha Benjamin [7], Safiya Noble [56], Alex Hanna[38], and Ihudiya Finda Ogbonnaya-Ogburu[59], who argue that computing is inseparable from the historical and social contexts in which it operates.

Extending this tradition, our research draws on the liberatory computing framework developed by Walker et al. [91], which outlines five interconnected pillars: sound racial identity, critical consciousness, collective obligation, liberation-centered academic identity, and activism skills to use computing to mitigate systemic oppression. These liberation pillars equip students to challenge systemic oppression through both technical and sociopolitical strategies [31]. By weaving this framework together with the Archaeology of Self™, we offer a justice-centered approach to data science. Embedding structured self-examination into curriculum, teacher training, and professional development is not a luxury—it is foundational for designing just and community-informed technologies.

2.2 Critical Participatory Action Research and Data Science

Reflexivity alone has proven insufficient in addressing systemic oppression, particularly within the context of participatory AI projects[11, 22, 43]. While participation scholars have emphasized reflexivity as a means for researchers and practitioners to responsibly navigate their positional power over stakeholders, existing power imbalances, especially between designers, developers, and community participants, often limit its impact[14, 22, 25, 34, 43, 45]. As a result, reflexivity by itself may fall short in fully centering stakeholder values throughout the design process [25, 39]. This shortcoming underscores the need for participatory approaches that move beyond individual reflection to actively restructure power relationships and engage communities as co-creators of knowledge and design.

Restructuring power is essential to preventing systemic harm in AI[79]. Past research has shown that when technology companies and researchers collaborate with minoritized communities, they often fail to fully capture the community's needs and desires, prioritizing the interests of the technology company or institution instead[35, 50, 76, 86]. In some cases, these collaborations can exacerbate problems for the community, or leave the community without the resources or ability to sustain the project once the researcher's funding or grant period ends[23, 25, 26, 46]. Participatory design (PD) is an approach that actively involves community members in the design, development, and implementation phases of projects to ensure that technologies and systems reflect their needs and values [20, 51, 79]. While PD focuses on co-creating solutions with users, Critical Participatory Action Research (CPAR) extends this by emphasizing collective inquiry and action aimed at challenging systemic inequities and redistributing power [3, 6].

CPAR, which has primarily been used in the fields of education and social science, is highly relevant to data science because it goes beyond merely involving communities in the research process[2, 13, 63, 84]. It emphasizes conducting critical work aimed at addressing systemic oppression, ensuring that the research leads to lasting change[17, 27, 69, 83]. In the context of data science and AI, this means that data scientists must not only collect and analyze data, but critically assess how their work might reinforce or challenge existing systems of power. When applied to data science, CPAR facilitates more equitable practices by ensuring that communities are not just subjects of study, but active participants in the process, with an emphasis on creating real-world impact[4, 9]. In essence, data science must involve both introspective self-work and the use of CPAR to ensure that data science practices are technically sound and justice oriented.

3 Positionality

All of the three researchers involved in the data analysis self-identify as African American. Our shared racial identity shaped how we approached the analysis, particularly in recognizing and valuing the cultural nuances and lived experiences described by participants. As researchers, we brought a commitment to justice-centered inquiry and reflexivity, approaching the work as co-learners deeply engaged with the communities we study. This positional alignment was essential in cultivating trust with participants and interpreting the data in culturally grounded and contextually informed ways.

4 METHODS

In this section, we outline the methods used in our study. We begin by providing an overview of the Data Activism Program and the students who participated. We then describe our qualitative approach to analyzing the student interviews.

4.1 Data Activism Program

The Data Activism Program trains high school and college students in Critical Participatory Action Research (CPAR), participatory AI and data science. Over 120 hours in six weeks, students partner with community organizations to address systemic inequities and design inclusive solutions. Art-based activities such as blackout poetry and data drawings foster engagement, while training in Python and

Pandas equips students to analyze data and create visualizations that reveal community inequities.

In 2024, the program expanded to offer both in-person and virtual formats nationwide, featuring pre-recorded lectures and materials for independent facilitation by educators. Since students in the virtual program were from different cities, not all of them engaged in CPAR. However, all teachers who used these materials were trained in CPAR practices. Only students who completed final projects aimed at addressing systemic issues within their own communities participated in CPAR directly, while others supported those students, even if the projects were not focused on their own communities. Students engaged in intersectional data analysis, examining how race, gender, and class interact to shape social justice issues. Using Python and Pandas, they cleaned and analyzed data, generated descriptive statistics, and created visualizations highlighting disparities in areas such as AI fairness, food insecurity, and affirmative action (Click this link for the entire curriculum). These real-world projects equipped students with skills to become future leaders in data activism.

Students collaborated with four social justice organizations: the Algorithmic Justice League (AJL), Vera Institute of Justice, AfroPink, and Sea Grant. With AfroPink, they investigated breast cancer disparities in African American communities, creating visualizations and reports used for advocacy and funding. With Vera, they analyzed links between dropout rates and mass incarceration in Baltimore, informing youth-centered research. Students partnered with AJL to study school surveillance biases and advocate for equitable AI policies, and with Sea Grant to examine ocean acidification's impact on minoritized communities and the seafood industry, producing research that guides community support.

4.2 Participants

All participating students identified as having African ancestry. The Data Activism Program served as a paid summer job: in-person students earned $1200 through local youth employment programs, and virtual students received a $1200 scholarship upon completing the six-week, five-day-a-week program. Twenty students attended in person (18 high school, two college), and 14 participated virtually (six high school, eight college). Community partners collaborating on final projects were compensated $800. Written consent and assent were obtained from all participants, parents, and organizers. Our team designed and taught the curriculum, recruited students nationwide, and collected data. This analysis focuses on data from youth researchers' program activities and interviews.

4.3 Semi-Structured Interviews

We conducted interviews with 28 high school and college students after the program: 8 from the virtual program (4 college, 4 high school) and 20 from the in-person program (18 high school, 2 college). Interviews lasted about 90 minutes and explored how the program shaped students' views on racial identity. Table 1 in Appendix 3 presents the interview questions (first column), followed by Cohen's Kappa values indicating interrater reliability (second column). The third column specifies whether the coding was conducted inductively or deductively. The fourth column identifies the specific subcomponents of sound racial identity reflected in the responses. The final column indicates the corresponding section of the Results where each question is discussed. Students also reflected on how their identities shaped their projects or moments when they questioned their assumptions (see Table 1). To support these reflections, we used the Social Identity Wheel (Fig. 2 in Appendix 2), which helps students critically map intersecting identities and fosters justice-centered inquiry [33, 78].

4.4 Data Analysis

We transcribed interviews using Assembly AI and manually reviewed them for accuracy. Three research assistants, who also mentored students in the Data Activism Program, helped analyze the data and verify themes. Researchers conducted a collaborative thematic analysis, iteratively developing a codebook (see Table 3 in Appendix 5) and coding questions inductively or deductively. Interrater reliability was measured with Cohen's Kappa (−1 = complete disagreement, +1 = perfect agreement), with values above 0.70 indicating strong agreement (see Table 1 in Appendix 3). Researchers coded interviews independently and resolved disagreements through discussion. For the question on how personal identity influenced final projects, responses were coded "yes" or "no," so interrater reliability was not calculated(see Table 2 in Appendix 4).

5 RESULTS

This section examines our efforts to address the research questions:

(1) To what extent does the Archaeology of Self™ framework promote student reflexivity and support the development of a sound racial identity?
(2) How does heightened reflexivity and a strengthened sound racial identity shape students' engagement with data activism?

This section presents the results gathered from interviews with all research participants. Post-program interviews revealed two key findings:

(1) Strengthened Sound Racial Identity: Students reported growth across all three components of a sound racial identity(higher private regard, increased racial centrality, and greater awareness of low public regard).
(2) The AOS Led to Interrogating Systemic Racism in Data Activism: Students were able to clearly articulate how their racial identity as African Americans influenced their approach to their data activism projects. They identified specific moments when they questioned their assumptions or internalized biases, illustrating how reflexivity can shape technical decisions.

5.1 Strengthened Sound Racial Identity

We assessed student's sound racial identity development according to these three components of a sound racial identity: high private regard, high centrality, and low public regard. In response to the interview question about whether the project influenced their view of racial identity(refer to Question 1 in Table 1 for the full interview question), the majority of students said that the Data Activism Program improved their outlook on their racial identity in three ways: an increased high private regard (17 people), an increased high centrality (10 people), and an increase in low public regard (5 people). Most students showed improvement in multiple aspects

of developing a strong racial identity. Ten people out of the 27 students said that the program did not change their outlook on their racial identity because they already felt secure in their race. However, it is important to note that when we asked more targeted questions related to high racial centrality and low public regard, a greater number of participants reported experiencing growth in these specific aspects of a sound racial identity.

Responses revealed a deep interrogation of their own beliefs and histories, showing how the program fostered a stronger connection to their racial and ethnic identity. Many students reflected on how their understanding of race and ethnicity had been shaped by family narratives and historical context, underscoring the complexity of identity formation. These reflections also highlight the limitations of traditional AI models that attempt to quantify the African American experience, often failing to capture its depth and nuance. This section will answer the first research question because it reveals how students critically engaged with their personal histories, challenged dominant narratives, and articulated a more empowered, self-defined sense of racial identity.

5.1.1 High Private Regard. When asked about how the project impacted their views on racial identity, most students reported an increased sense of private regard, reflecting a strengthened positive attitude toward their racial group (refer to Question 1 in Table 1 for the full interview question). One student showed improvement in their high private regard by recognizing the importance of approaching certain situations more thoughtfully, especially those related to their community. The student mentioned,

> *"I'm just learning to take things a little bit more seriously,"*

This student acknowledges a shift in their attitude toward matters that could have been previously dismissed. This includes jokes that might have perpetuated stereotypes about their community, with the student expressing a desire not to "pass them off" anymore. This reflects an increased awareness of how such jokes impact both their personal identity and how they view others' perceptions of their community. Their growth is evident in the recognition that these issues should be taken with greater care, reflecting a deeper sense of respect for being African American and the broader implications of these behaviors.

Another student further elaborated on how the concept of intersectionality contributed to an increase in their high private regard, stating,

> *"But understanding intersectionality,how you are an ethnicity, but in America, you're African American, was important. My parents are citizens, so they're African American here. You have to understand this is who you are within the context of the society you live in, and adapting is necessary to feel comfortable."*

The student reflects on the complex relationship between their ethnicity and race shaped by the narratives passed down from their family. This highlights the inadequacy of AI attempting to quantify the African American experience, as such efforts often erase its rich complexity. This is particularly problematic when working with a race that has faced systemic oppression from every angle, a reality rooted in a history of dehumanization and violence, such as the African American community.

5.1.2 High Centrality. Throughout the interviews, students shared several reasons why they began to view their race as a more central aspect of their personal identity (high centrality) while engaging in data activism (refer to Question 2 in Table 1 for the full interview question). Many highlighted the importance of observing positive representations of inspirational African Americans (10) and expressed pride in students coming together to make a meaningful difference (11). Some students emphasized the value of being able to relate to their teammates due to all the students being African American (4), while others appreciated the opportunity to share new insights about the African American experience in their final projects (3) or discover other commonalities within their group (3)(see Table 3 in Appendix 5). Additionally, one student noted the significance of having a platform to express themselves. All but one student reported an increase in their racial centrality over the course of the program.

A significant number of participants emphasized the theme of "positive representation," noting that the project allowed them to see themselves reflected in a favorable light. For example, several students shared that learning about inspirational African American data activists, such as Dr. Joy Buolamwini, the AfroPink community partner, Ida B. Wells, and Bryan Stevenson(the founder of the Equal Justice Initiative) deeply resonated with them. These data activists served as role models and affirmed students' sense of belonging and potential within the field of data science.

Another prominent theme was "collective action," with many participants highlighting the importance of working together with others of the same racial background to pursue shared goals. As one student remarked,

> *"Since I'm not often around people who look like me, it felt good to see that there are others who share similar interests and work ethic, such as being able to...focus on something for hours without rushing or slacking off."*

This student found the program both inspiring and transformative, as it allowed them to collaborate with people who shared similar cultural backgrounds.

Additionally, some participants valued the experience of "relating to others based on race," emphasizing the sense of connection and mutual understanding fostered by engaging with people who shared similar experiences. One participant reflected on connecting with older African American women, saying,

> *"Speaking with an older African American woman is like someone dropping a bucket of wisdom onto you. I loved my interviews with the grannies and aunties. It felt like they were giving me so much information. I felt really proud because I don't see this kind of closeness with other cultures."*

Lastly, one participant noted the "ability to express oneself," recognizing that the project provided a safe space and platform to voice their thoughts and experiences. Overall, it was exciting to see the students build a community of fellow African American students, all equally dedicated to learning about reflexivity. This sense of high centrality in their race motivated them to engage more deeply with data activism.

It is important to recognize that some students' responses reflected growth across multiple subcomponents of a sound racial identity. This is an expected overlap, as these dimensions are often

deeply interconnected, as noted in related scholarship. Additionally, nine people discussed how they increased their higher private regard and higher centrality. Notably, four students shared how their identification shifted from feeling more aligned with their ethnicity to a stronger connection with their race. One student explained,

> *"Even though I come from an Afro-Latino country, I never related myself or considered myself African American, especially because I'm also pretty light. But after this project, I kind of see that, especially with the people that we were with... for example, Student 2, who is also Dominican, and they are African American."*

These quotes highlight the cultural complexity of engaging in self-archeology, as it involves uncovering the narratives instilled throughout one's life by family, society, and personal experiences. This process requires examining whether these narratives align with or challenge the mission of using data science to mitigate systemic oppression.

5.1.3 Low Public Regard. When asked whether they gained a better understanding of how society holds biases and negative beliefs about African Americans (refer to Question 3 in Table 1 for the full interview question), responses from 24 high school and college students clustered into two main themes: "Increased Awareness of the Prevalence of Racism" (13 students) and "No Increased Awareness of the Prevalence of Racism" (11 students)(see Table 3 in Appendix 5). One participant shared that the program changed how they understood and perceived their racial identity, stating

> *"In school, we tend to say there's no such thing as race—we don't look at race. But subconsciously, everyone has looked at a person and felt some type of way due to stereotypes or media influence. It's something some people choose not to acknowledge, while others maintain a perspective influenced by those biases. Coming into this program, I didn't really think about it that way."*

Respondents who shared this perspective emphasized a deeper understanding of how racism influences perceptions, suggesting that the program fostered greater awareness of systemic racial issues. However, students who indicated no change in their public regard explained that they were already highly aware of the negative stereotypes associated with being African American. Overall, the findings show the importance of incorporating reflexivity into data science and AI, with several participants noting that the program deepened their understanding of systemic injustice.

5.1.4 Strengthened Sound Racial Identity Discussion. Our findings indicate that the Archaeology of Self™ framework played a significant role in fostering a well-developed racial identity. The framework assisted students with critically engaging with their personal histories, interrogating dominant racial narratives, and articulating an empowered, self-defined sense of racial identity. When asked whether their perspectives on racial identity had shifted, the majority of students reported that they had. Furthermore, important indicators of a sound racial identity, such as high centrality and low public regard, demonstrated positive change. Students shared deeply reflective narratives, demonstrating how their understandings of race and ethnicity had been shaped by familial, historical, and cultural experiences. This kind of introspection showed the limitations of traditional AI systems that attempt to quantify the African American experience without accounting for its richness and complexity.

5.2 The AOS Led to Interrogating Systemic Injustice in Data Activism

Also, we asked our participants to reflect on how their personal identities influenced their data activism projects and whether they had critically examined their own assumptions or biases (see Question 4 in Table 1 for the full interview question). This section explores how the most frequently cited identity themes, including race, socioeconomic status, and spirituality, shaped students' engagement with data activism and deepened their critical self-reflection. All students incorporated themes related to race and ethnicity into their final projects and reflected on their racial experiences throughout the process. Participants also identified with a range of other dimensions from the Social Identity Wheel: religion and spirituality (50%), socioeconomic status (82%), gender identity (50%), gender modality (7.9%), sexual orientation (8%), romantic orientation (0%), nation of origin (47%), first language (29%), (dis)ability status (21%), Indigenous or tribal affiliation (24%), age (68%), and body type/size (3%)(see Table 2 in Appendix 4). Many students reported that race was the most accessible aspect of identity to interrogate, given the project's explicit focus on anti-Blackness. Overall, these findings suggest that when participatory AI or data science projects are designed to explicitly confront systemic injustice, they create space for students to engage in deeper reflexivity and to ground their technical work in justice-oriented action.

5.2.1 Centering Race in Data Activism. The data reveals that students' personal identities played a significant role in shaping their approaches to their final projects, with many reflecting on aspects such as race and ethnicity. For example, Student 1 from the AfroPink group shared,

> *"In the back of my mind, I was always thinking, within the context of healthcare, 'How are African Americans treated? Are they getting the treatment they need, and do they have the financial resources? "*

This reflection reveals how students moved beyond surface-level data analysis to interrogate the deeper systemic issues that impact health outcomes for African American communities. It shows how their learning was driven not just by curiosity, but by a commitment to racial justice and a desire to use data as a tool for meaningful change.

A student collaborated with the Vera Institute of Justice on a project exploring how poverty, race, and underfunded schools increase incarceration risk. Growing up in Baltimore, they experienced attending predominantly Black, underfunded schools, which inspired their project. Before the class, they joked about their school's lack of resources, but the course encouraged them to think critically about why they used humor to cope and to see underfunding as part of systemic issues, such as the school-to-prison pipeline. The student stated,

> *"Our schools are underfunded. Recently, one of our middle schools was converted into a high school, but funding didn't arrive in time. The outdoor basketball court, tennis courts, and track were all torn up in preparation*

> *for construction—but nothing was built all year. What was left was mud, dirt, and abandon. We'd laugh about it jokingly, but in reality, the school was completely neglected. "*

This quote demonstrates how taking a reflexive approach to data science fundamentally changed the student's project outcomes. By connecting personal experience to systemic analysis, the student moved beyond surface-level correlations and began to interrogate the root causes of educational inequity. Reflexivity enabled them to recognize how their lived reality was not just anecdotal, but a critical site of data and insight. This shift from joking about underfunding to analyzing its links to mass incarceration transformed their data science project into a tool for advocacy.

Reflections from the Ocean Acidification group show that students were prompted to connect their identities and lived experiences to data science. One student from the Ocean Acidification group reflected:

> *"Most people were talking about how they felt that their race had an impact on the environments where they live ... Some people described how, in their living situations, they noticed issues like poor air quality and lots of highways near where they lived ... People pointed out that areas with more environmental problems were often communities of color, while the nicer neighborhoods with fewer environmental issues were mostly White or higher-income areas."*

The student's awareness of how race shaped exposure to environmental hazards led the group to move beyond treating the data as purely scientific, recognizing its ties to structural inequities. Their final report included geospatial analyses of environmental quality across racial and socioeconomic groups, an approach likely inspired by the reflexivity prompts, which led to more justice-focused research questions and outcomes.

Members of the Ocean Acidification group highlighted the lack of research on how environmental issues affect African American communities. One student studying ocean acidification reflected on the challenge of quantifying its impact on minoritized groups and questioned whether it disproportionately harms African Americans. In under-researched areas of racial inequity, such as ocean acidification, students struggled to connect their identities to the content due to limited research on the intersection of race and ocean acidification. This creates a self-perpetuating cycle: when data scientists fail to incorporate reflexivity into their work, marginalized communities have fewer opportunities to share their lived experiences and influence the process, further reinforcing the urgent need to prioritize reflexivity in the field.

5.2.2 Centering Socioeconomic Status in Data Activism. Socioeconomic status emerged as a central theme across multiple student projects, shaping how participants interpreted systemic disparities in health, education, and other topics. Regarding socioeconomic status, one student from the AfroPink group noted that this theme emerged prominently in their exploration of health disparities. Their project focused on understanding why African American women face disproportionately high mortality rates, particularly in relation to breast cancer. A key factor they identified was limited access to healthcare due to socioeconomic constraints. The student reflected:

> *"When we interviewed the women, I realized that most of them came from more financially secure backgrounds. In the back of my mind, I kept thinking ... this isn't representative of all African American women."*

This reflection illustrates the group's effort to critically examine the limitations of the people they interviewed and acknowledge how economic inequality influences health outcomes, particularly for those who may not have the same access to resources.

By engaging in reflexivity about socioeconomic status, students were able to question their assumptions and improve the relevance of their findings. One student from the Vera Institute of Justice group stated,

> *"My school is in the middle of Dorchester and Roxbury… and that's not a very upper-class area. I was trying to figure out how the camera situation might differ in an upper-class school."*

The reflection shows that they were actively interrogating how socioeconomic and racial context influences data about school surveillance.

Additionally, one student from the Algorithmic Justice League shared a similar reflection, noting,

> *"The schools that are surveilled tended to be of lower socioeconomic status and also public. The majority of the students who completed the survey were also low-income."*

This is precisely the kind of reflexive outcome we aimed to cultivate. Rather than simply reporting on the presence or number of cameras, the student began to ask deeper, justice-oriented questions: *Who is most surveilled? How do neighborhood demographics shape surveillance intensity? What inequities might be hidden by a purely quantitative analysis?*

5.2.3 Centering Spirituality in Data Activism. An insightful finding from the Social Identity Wheel was that 50% of participants discussed incorporating religion or spirituality into their projects. One high school student from the AfroPink group, for example, interviewed four African American women who had experienced breast cancer. Through qualitative analysis, the student found that all four participants described religion and spirituality as central to their healing journeys. The student reflected:

> *"I noticed a common theme in all the interviews. Each woman said she really relied on religion to get through the hardest parts of treatment and recovery. It also tied back to the idea of family and community, especially in the African American context, where the church plays a major role."*

Rather than imposing predetermined narratives, the student practiced reflexivity, allowing cultural and spiritual identity to emerge as a key lens through which to understand systemic health injustices. This approach highlights how spiritual identity, often overlooked in computing fields, can provide critical context for examining structural oppression and for designing justice-oriented interventions.

Reflexivity shaped both the content of the analysis and the conditions under which the analysis was produced, leading to more

thoughtful and inclusive outcomes. One student from the Ocean Acidification group stated,

> *"My religion is a part of like my daily life, and how I am as a person, I make sure that I treat people kindly and everything and like try to avoid problems, arguments, and whatnot."*

This reflection highlights that reflexivity influenced data science decisions and the team's collaboration and problem-solving approaches, which is as critical to the data science process as data science and AI skills. Strong collaboration affects data cleaning choices, interpretation of results, and how findings are communicated.

5.2.4 The AOS Led to Interrogating Systemic Injustice in Data Activism. This section explores how the most frequently cited identity themes, including race, socioeconomic status, and spirituality, shaped students' engagement with data activism and deepened their critical self-reflection. Importantly, all students incorporated themes of race and ethnicity, often focusing on confronting anti-Blackness, and many drew directly from personal experiences as an entry point into their data activism. These results address both primary research questions guiding the study about how the Archaeology of Self™ framework cultivates student reflexivity and racial identity development. In summary, the AOS framework fostered a cyclical relationship between self-exploration and activism: as students became more reflective and confident in their racial identity, they produced more critical, purposeful, and socially responsible work—highlighting the power of centering identity in data activism.

6 DISCUSSION

In the discussion section of this paper, we return to the foundational problem raised at the outset: the field of computing suffers from a deep representational crisis[67]. Our findings offer a path forward. They suggest that a more equitable data science and AI field is not only possible but already emerging when young people are given the tools, space, and frameworks to engage meaningfully. This work offers two key insights into how the AI field can effectively integrate the perspectives of minoritized groups, each of which is discussed below:

6.1 Engaging in the Archaeology of Self™ (AOS) framework transforms how youth relate to data science—and to themselves

Importantly, the youth in this program were co-researchers, co-designers, and change agents. Their success reveals a larger imperative for the field: we must create more opportunities for minoritized youth to engage in data science and transform the field to value the kinds of insights they bring[44, 65, 71]. This requires a rethinking of educational standards and institutional investments[62, 75]. Reflexivity should be embedded into K–12 computer science, statistics, and civics curricula—not as an add-on, but as a foundational component of liberatory computing education. This includes integrating structured self-examination tools into teacher training, curriculum design, and corporate AI onboarding programs. In K–12 education, reflexivity can be woven into Common Core-aligned standards by encouraging students to reflect on their own assumptions when interpreting data in statistics classes, or by critically analyzing who creates algorithms in computer science courses. In civics, reflexivity can support students in examining how their identities shape their engagement with civic data and public policy. These integrations do not require entirely new lessons but can be embedded into existing projects, such as asking students to consider whose voices are missing in datasets or how algorithms may affect minoritized communities differently. Embedding reflexivity into these standards prepares students to approach AI as social systems with ethical implications.

6.2 The benefits of reflexivity are not limited to youth or to minoritized communities

While AOS was designed with the needs of minoritized students in mind, our findings suggest that reflexivity should be a foundational practice for all data scientists and AI developers. We argue that reflexivity supports minoritized youth and it will also support engineers in different but complementary ways[15, 16]. This practice of self-examination is crucial because it enables data scientists and AI developers to begin dismantling entrenched ideologies within their fields[25, 73, 85]. The responsibility for change extends beyond individual developers to include decision-makers at higher levels of an organization[52].

Academic institutions, funding agencies, and corporate actors must recognize that sustaining reflexivity-centered initiatives requires long-term structural commitment rather than short-term interventions. Supporting this work demands that data scientists be trained in computing skills and in reflexive practices that examine how their identities, biases, and institutional contexts shape the tools they build. AI policy must embed these expectations by mandating reflexivity training as part of professional certification, grant eligibility, and organizational standards. Reorienting professional development in this way positions self-examination as a core competency for data scientists and AI developers.

The Archaeology of Self™ mitigates AI's potential to amplify racism, confronting the misconception that diverse computing teams are unnecessary, and addressing the false belief that minoritized communities and youth can not make meaningful contributions to the data science development process. Crucially, this requires valuing the time, labor, and intellectual contributions of youth as current theorists, builders, and critics of AI systems[58]. We strongly encourage AI development teams to meaningfully incorporate youth into the design and development process. This may require additional psychological support and infrastructure to ensure students' well-being and prevent AI from causing psychological harm. It is essential to involve the generation growing up with AI in shaping the processes that determine how these technologies are designed and used.

7 CONCLUSION

The findings from students' growth in their reflexivity skills suggest that this Archaeology of Self™ approach holds significant potential for advancing justice-oriented applications of data science and AI. These findings underscore the importance of providing individuals from minoritized communities with opportunities to explore these issues and advocate for change through accessible applications of data science. Future research should examine how reflexive practices benefit professionals in computing fields, which we will do.

In future work, we plan to develop an online version of the Data Activism curriculum, allowing computing professionals to access and download the materials, equipping them to adopt reflexive practices and integrate them into their professional activities.

Ultimately, this research illustrates that reflexivity is not a luxury or an afterthought—it is a necessity for data science that fully reflects the people whose experiences it is claiming to capture. When data science makes space for youth to show up fully, and when institutions are willing to critically reflect on their own practices, we move closer to a version of the field that is not only more inclusive, but more transformative. The question is not whether African American youth can do data science. The question is whether data science is ready to change in order to truly include them. The students' reflections make this clear: they were not simply gaining skills—they were witnessing the power of what it means to be in community with other scholars, thinkers, and builders.

One limitation of this study is the lack of pre-program data on participants' racial identity. Without a baseline, it is difficult to determine the extent to which the program shifted participants' perspectives. We are currently preparing a longer journal article for publication at another venue that incorporates additional data, offering deeper insights into participants' racial identity prior to the program.

8 RESEARCH ETHICS AND SOCIAL IMPACT

8.1 Ethical Considerations

Ethical considerations were central to this research, which received IRB approval. Written consent and assent were obtained from all participants, and participation was voluntary with the option to withdraw at any time while still receiving a stipend. Students and community organizers were compensated for their contributions. All interview data were securely stored on a cloud platform, accessible only to the research team.

8.2 Adverse/Unintended Impacts

This work, while contributing valuable insights into data activism and reflexivity in minoritized communities, may inadvertently reinforce existing biases if its findings are misinterpreted or applied without proper context. Discussions of systemic oppression may also cause distress, so leaders must empower participants and emphasize their agency. Without careful, intersectional implementation, data activism projects risk entrenching inequalities. Future research should prioritize that diverse perspectives are meaningfully represented.

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9 Appendix

9.1 Appendix 1

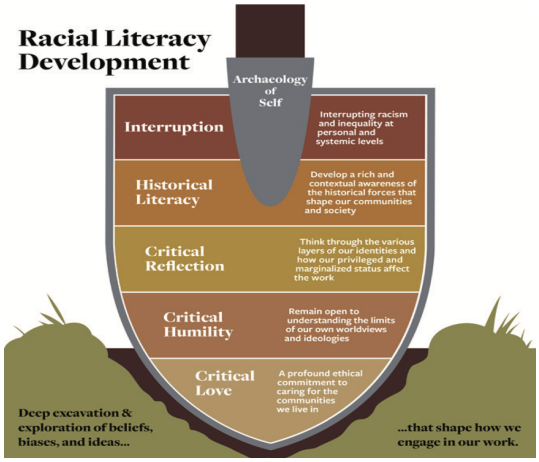

Figure 1: Racial Literacy Development model emphasizing Archaeology of Self™

9.2 Appendix 2

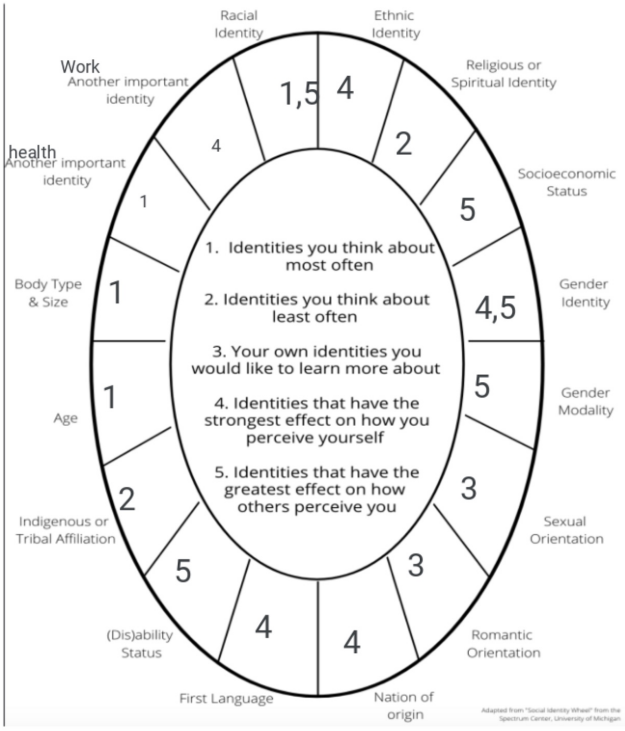

Figure 2: Social Identity Wheel from the Spectrum Center at the University of Michigan as filled out by Student 1 in the Data Activism Program

9.3 Appendix 3

Table 1: Overview of Interview Questions

Interview Question	Cohen's Kappa	Reasoning	Sound Racial Identity Subcomponent	Results Section
1. Did this project influence your perspective on your racial identity or how you view your race? If so, how?	71.7%	Deductive	High Private Regard, High Centrality, Low Public Regard	5.1
2. Were there any aspects of this final project or in the class in general that made you more proud of your race? If so, what were they?	80.1%	Inductive	High Centrality	5.1
3. How did the way you believe others perceive you because of your race change?	78.4%	Inductive	Low Public Regard	5.1
4. What aspects of your identity—such as race, religion, or socioeconomic background—did you bring into this project?	N/A	Inductive	N/A	5.2
5. How did your identity influence the approach you took while working on the project?	N/A	Inductive	N/A	5.2

9.4 Appendix 4

Table 2: How did your identity influence the approach you took while working on the project?

Identity	No	Yes – Oppressed (%)	Yes – Reminded (%)
Race/ethnic identity	42.31	57.69	0.00
Religious or spiritual identity	66.67	29.63	3.70
Age	62.96	25.93	11.11
Gender identity	74.07	14.81	11.11
Nation of origin	81.48	11.11	7.41
First language	85.19	7.41	7.41
Romantic orientation	88.89	3.70	7.41
Sexual orientation	88.89	3.70	7.41
Socioeconomic status	66.67	3.70	29.63
Gender modality	85.19	3.70	11.11
Indigenous or tribal affiliation	92.59	0.00	7.41
Disability status	92.59	0.00	7.41
Body type and size	96.30	0.00	3.70

9.5 Appendix 5

The Appendix on the following page contains Table 3, which presents a comprehensive codebook for the interview questions.

Table 3: Comprehensive Codebook for Interview Questions

Code Name	Definition
High Private Regard	Positive feelings and pride about being African American; valuing one's racial group.
High Centrality	Seeing one's racial identity as central to how they define themselves and navigate the world.
Low Public Regard	Belief that others in society hold negative views about African Americans.
Positive Representation	Recognition of inspirational African American figures and the value of seeing one's racial group represented positively.
Collective Pride and Impact	Expression of pride in contributing to a meaningful cause through collaboration within a shared racial group.
Relational Identity Alignment	The sense of comfort or empowerment gained from working with peers who share a racial identity.
Sharing Cultural Insight	Appreciation for opportunities to express and contribute personal or cultural experiences.
Discovery of Group Commonality	Recognition of unexpected similarities or shared experiences within a racial or cultural peer group.
Increased Awareness of the Prevalence of Racism	Heightened understanding of systemic racism and how African Americans are perceived by others.
No Increased Awareness of the Prevalence of Racism	The student did not gain a better understanding of how society holds biases and negative beliefs about African Americans.
Racial Identity	One's identification with a racial group, including related experiences, values, and self-understanding.
Ethnic Identity	One's connection to cultural heritage, traditions, ancestry, or national origin.
Religious or Spiritual Identity	Beliefs and practices that connect an individual to spiritual traditions or religious communities.
Socioeconomic Status	Economic and social position based on income, education, and occupation.
Gender Identity	One's internal understanding and experience of their gender.
Gender Modality	Whether one's gender identity aligns with the sex assigned at birth (cisgender) or not (transgender, etc.).
Sexual Orientation	Romantic or sexual attraction to others based on their gender.
Romantic Orientation	Romantic attraction independent from sexual attraction.
Nation of Origin	The country where one was born or where their family originates.
First Language	The language a person learned first and may most comfortably use.
(Dis)ability Status	Physical, emotional, developmental, or mental differences that impact a person's daily life.
Indigenous or Tribal Affiliation	Connection to an Indigenous or Native community or tribal group.
Age	Chronological age or generational cohort.
Body Type & Size	Perceptions or realities of one's physical body, including size, shape, and appearance.
Health	Physical and/or mental well-being and experiences related to illness or chronic conditions.
Another Important Identity	Other personally meaningful identity category not listed elsewhere.