RESEARCH ARTICLE

Inclusion for STEM, the institution, or minoritized youth? Exploring how educators navigate the discourses that shape social justice in informal science learning practices

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Abstract

Understanding equitable practice is crucial for science education since science, technology, engineering, and mathematics (STEM) fields and STEM learning practices remain significantly marked by structural inequalities. In this paper, building on theories of discourse and situated meaning developed by Foucault, Gee, and Sedgewick, we explore how educators navigated discourses about social justice in informal science learning (ISL) across four UK sites. We draw on qualitative, multimodal data across 5 years of a research–practice partnership between a university, a zoo, a social enterprise working to support girls and nonbinary youth in STEM, a community digital arts center, and a science center. We identify three key discourses that shaped social justice practices across all four practice–partner sites: (1) "inclusion" for STEM, (2) "inclusion" for the institution, and (3) "inclusion" for minoritized youth. We discuss how educators (n = 17) enacted, negotiated, resisted, and reworked these discourses to create equitable practice. We argue that while

the three key discourses shaped the possible meanings and practices of equitable ISL in different ways, educators used their agency and creativity to develop more expansive visions of social justice. We discuss how the affordances, pitfalls, and contradictions that emerged within and between the three discourses were strategically navigated and disrupted by educators to support the minoritized youth they worked with, as well as to protect and promote equity in ISL. This paper contributes to research on social justice in ISL by grounding sometimes abstract questions about power and discourse in ISL educators' every-day work.

KEYWORDS

afterschool club, coding club, community center, equity, science center, social justice, zoo

1 | INTRODUCTION

I've had kickback with things. I remember I was in [ISL site] and their only representation of a Black person was in their jungle room, and it was a cartoon, and he was carrying a spear. So, I brought that up and it caused offence. [...] But also, I just think it's that the default is so ingrained in our society and everything that we do, altruistic as it is, as educational as it is, as environmentally friendly as it is, everything is still based on money and where that money comes from. And at the end of the day, if that gets affected, then no idea is a good idea. Cole

While equitable, socially just science, technology, engineering, and mathematics (STEM) education is frequently discussed in journals such as this one, exclusion seems at times like an intractable problem (Settlage & Williams, 2022). Indeed, as Cole[1] explains in the opening quote above, for him socially just practice in STEM education was always contested. It was contested directly at the moment (challenging racist, colonial representations), as well as the broader context that informal science learning (ISL) educators operated within (financial constraints), because it was shaped by multiple, sometimes conflicting ideas. This theme of contestation is also echoed in the literature, in terms of the theories and language used, and what might constitute equitable and socially just practice (Burgess & Patterson Williams, 2022; Dawson, 2023; Fortney et al., 2019). Indeed, as we discuss below, the seemingly simple language of social justice, equity, equality, and inclusion covers extremely complex, contested, and multiple practices that are inevitably experienced in many different ways. Understanding what shapes social justice in STEM education in the everyday lives of ISL educators, and how they, in turn, shape and disrupt what is possible to conceptualize and do, is an important piece of the puzzle.

Research has long suggested that equitable ISL has the potential to support a broad range of people to engage with, access, learn about, and participate in STEM Bell et al., 2009; Bevan et al., 2018; Canfield et al., 2020; King & Pringle, 2019). Indeed, this has been a rallying cry across the international ISL field (see, e.g., Achiam & Sølberg, 2017; Falk & Dierking, 2010). However, this claim is worth thinking through carefully since research also shows that including people from minoritized backgrounds in unchanged and often exclusive ISL practices can

exacerbate their exclusion and alienation (Achiam & Holmegaard, 2017; Dawson, 2014, 2019; Dawson et al., 2019; Tran & Gupta, 2021). Evidently then, as Cole's opening quote suggests, equitable ISL sits within a contested space.

This paper contributes to international research on social justice and equity in STEM education by exploring how educators (n = 17) navigated the equity and social justice discourses that shaped their work in four informal STEM learning (ISL) organizations in the United Kindom over 5 years. The project was a longitudinal, collaborative research–practice partnership (RPP) between a university and four practice partners. The RPP explored and developed equitable ISL practices with and for young people from minoritized backgrounds. Practice partners, educators and researchers were already committed to equitable practice before the project began. This study was not an intervention project (designed to initiate equitable practice) but rather sought to better understand educators' years of expertise in equitable ISL, to support its further development, and to share equitable practices across different sectors within the ISL field. The four practice–partner organizations were a social enterprise working to support girls and nonbinary youth in STEM, a zoo, a community digital arts center, and a science center.

In this paper, we explore the discourses that shaped social justice in educators' ISL practices, drawing on the whole educator data set from the study and how educators navigated these discourses. We ask two questions: (1) which discourses shaped social justice practices for ISL educators and, 2) how did they enact, negotiate, resist, and rework these discourses? We argue that ISL educators navigated three key discourses in their work on inclusive practice: (1) "inclusion" for STEM, (2) "inclusion" for the institution, and (3) "inclusion" for minoritized youth. We use the term inclusion here when writing about practitioners discourses because we wanted to stay with the everyday language most used by educators involved in the project, though we note the term has its limits and is contested, which we discuss further below (Ahmed, 2012).

We discuss each of these discourses in turn, as well as educators' strategies for working with, through, against, and despite these discourses. We argue that the three key discourses identified constrained the possibilities for equitable ISL. However, drawing on theories of discourse, agency, and power, we also argue that educators navigated these discourses strategically, combining them for persuasive effect, as well as crafting new, more expansive possibilities for socially just, equitable ISL practice (Foucault, 1970, 1972, 1981; Gee, 1999; Sedgewick, 2003).

2.1 | Research about ISL educators' social justice practices

Amidst a small but growing literature about equity and ISL, some studies have focused specifically on educators. These include studies about how educators understand and experience justice-oriented work, educators' own reflections on such work, research about social justice in the context of training and professional development for ISL educators, and case studies of educators' equitable practice. We briefly discuss these below.

Research suggests social justice in ISL was often experienced as ideologically and practically fraught by ISL educators. Tlili's (2008) interview study of four UK ISL sites (two museums and two science centers) found practitioners struggled to align external, government policies about social inclusion with how they understood their work. Once folded into their work, ISL practitioners from various institutional roles, described equity and social justice as developing a visitor-ship representative of the wider population. Notably, this vision of social justice was conflated by those interviewed with the idea of reporting visitor statistics, marketing, and increasing the overall number of visitors (Tlili, 2008).

In a similar project, Feinstein and Meshoulam's (2014) study of 15 ISL sites in the United States found ideas about what they described as equity work were framed through a client or collaborative logic for the institutional managers they interviewed, with tensions between the two perspectives. This study's findings echo those of the former study but with a wider spread of ISL sites, including a zoo and an aquarium alongside science centers and museums. In both studies, interviewees framed equitable practice in relation to staying commercially competitive, with an eye to financial constraints. At the same time, however, the broader, collaborative models of equitable ISL the research in the United States identified, suggest ideas about community assets and participatory practices were

in play (Feinstein & Meshoulam, 2014). While a detailed account of ISL educators' equity and justice-oriented practices was not part of these studies, their findings suggest that concepts and enactments of social justice are far from straightforward in ISL and operate within organizational constraints.

Practitioners' own accounts of their experiences of working on equity and social justice in ISL practice, where these are publicly available, are similarly fraught with tensions.[2] Experiences that range from discomfort and the effort required to navigate an ISL institution as a staff member from a minoritized background, to tokenism, gaps between policies and actual practice, inexperience, lack of training and individuals becoming responsible for institutional change have all been documented (Adams, 2007; see, e.g., the chapters in this edited collection, Bevan & Ramos, 2022). For instance, as Bevan et al. (2022) argue, attempting to diversify visitors by attempting to diversify staff has created extremely uncomfortable work situations for staff expected to develop equitable practices, while being unable to single-handedly change exclusive institutional cultures. These points are echoed in Rende et al.'s (2021, p. 430) study. They surveyed 132 ISL educators in the United States about their views on what they termed "workforce equity and diversity" and found ISL educators were widely dissatisfied with what they felt were entrenched issues of racism, sexism, class discrimination, and more in their workplaces. Yet, at the same time, these were the same workplaces where they were expected to be able to cultivate equitable ISL (Rende et al., 2021). Evidently, ISL educators working on issues of equity and social justice experience a range of frustrations, though, again, these accounts do not focus on educators' everyday equitable ISL practices or the discourses that shape their work.

A third set of relevant studies of equity and ISL educators appear in the context of training and professional development and also shed light on educators' experiences and perceptions of justice-oriented practice. Tran et al. (2019, p. 140) discuss how collective, reflective practices were valuable for training educators in equitable approaches to ISL, which they suggest would have been a "heavy lift" without such processes in place. Indeed, Tran and Gupta (2021, p. 44) go on to argue that training ISL educators to be what they term "critically conscious" is crucial for equitable practice, not least because, as they note, there is no simple solution when it comes to addressing embedded structural inequalities. Of course, these are not new problems. Research on ISL in museums has long called for field-wide attention to equity issues and highlighted educators, and their training, as playing a pivotal role in justice-oriented transformation (Ash & Lombana, 2011, 2012; Golding, 2009; Gurian, 2006; Jennings & Jones-Rizzi, 2017; Rahm, 2010). Though these studies provide important context for understanding educators' roles, the focus on training interventions means the experiences of ISL educators working toward equitable practice over time in their daily work lives in ISL spaces are absent.

Finally, alongside studies of how ISL educators understand equity, personal accounts of professional experiences, and research on training sit another set of typically more positive professional stories of specific equitable ISL initiatives, often in the form of project case studies or evaluations (see, for instance, Aguirre, 2014; Garcia-Luis & Dancstep, 2019). A recent case study about the New York Hall of Science, for example, presented this US science centers' approach to developing equitable practice through organizational changes such as distributing team leadership and setting explicit, organization-wide goals for inclusion, rather than focusing only on changing visitors (Letourneau et al., 2021). Similarly, a case study of a citizen-science project based in a US natural history museum found that making equity a central project goal made the experience more inclusive for minoritized volunteers (Hinojosa et al., 2021). Staying in the United States, Gutwill et al. (2022) describe a project at the Exploratorium science center to create science center exhibits in public spaces beyond the ISL site with an emphasis on equity.[3] While these case studies are valuable for sharing learnings across the field, they rarely include a detailed focus on the day-to-day practices of ISL educators or the conditions that shape what is possible (often in a sizeable institution), providing instead a picture of a specific intervention.

2.2 | Broader themes in research on equitable ISL

That ISL educators experience equitable practice as conceptually and practically fraught is not surprising. Drawing on Freire's (2006/1970) work, we suggest that oppression and justice can be understood as dialectically configured.

That is, they are opposing, but closely connected issues, which need to be understood in relation to one another. Social justice issues are, as a result, multifaceted and contested, with specific sociocultural, political, and historic features, which inevitably translate into local, institutional contexts in a variety of ways, leaving tensions in their wake when it comes to STEM subjects and ISL organizations (Kayumova & Dou, 2022; Philip & Azevedo, 2017; Sharpe, 2016; Young, 1990).

In their review essay, for instance, Philip and Azevedo (2017) identified three different and somewhat contradictory discourses that they felt shaped equity in ISL research, focusing again on the United States. First, that better access to ISL would support students' successful science learning. Second, equitable ISL could challenge and change problematic epistemological practices in STEM. Third, STEM is simply another tool for collective movements with social justice goals. They concluded that how equity is conceptualized in ISL practice warrants further research and, crucially, that being more explicit about the meanings of equity is crucial for the field (Philip & Azevedo, 2017). In what follows we briefly review research about social justice in ISL that goes beyond ISL educators' experiences, to situate this paper in the broader landscape.

Much of the research about social justice in ISL is concerned with redistribution and for good reason. International research has repeatedly shown that access to ISL resources is marked by significant structural inequalities, not least racism, sexism, class discrimination, ablism and their intersections, and more (Dawson, 2019; Durall et al., 2021; Garibay & Huerta Migus, 2014; Gonsalves et al., 2013; Patiño Barba et al., 2019; Polino & Muñoz, 2018). ISL resources operate following what Feinstein and Meshoulam (2014, p. 368) describe as the "Matthew Effect," that is, they operate as additional resources for those in our societies who are most privileged. As a result, many justice-oriented ISL projects try to disrupt this Matthew effect and take the redistribution of resources as a starting point.

Simply put, from a redistributive perspective, social justice is achieved when everyone can access the same resources in the same ways. In this model, fairness is aligned with equality (Fraser, 2003; Rawls, 1971). Thus, a focus on numbers, and who participates, or in some cases, who is employed, volunteers, and/or is on the trustee board, reflects a concern with an unequal distribution of opportunities and outcomes (see, for instance, Bevan e al., 2022; Letourneau et al., 2021). From this perspective, justice is best understood as a redistribution of access, roles, jobs, and resources in favor of minoritized groups.

Alongside work on redistribution in ISL sits work that is also informed by relational social justice approaches to STEM education. These projects often start from the view that justice is about more than distribution (although it is certainly important) and focus just as much on recognition, respect, reparation, and power relations, an approach often referred to as equity (Carlone et al., 2011; Dawson, 2019; DiGiacomo & Gutiérrez, 2016; Finley et al., 1992; Kayumova & Dou, 2022; Lee & Buxton, 2010; Shea & Sandoval, 2020; Young, 1990). This growing body of work suggests meaningfully just ISL practice emerges where ISL organizations are able to work *with* rather than *at* or even *for* groups who have been excluded (King et al., 2021; King & Pringle, 2019; Vossoughi et al., 2016). Inevitably this approach necessitates changes to established professional practice, as suggested by the research about ISL educators' experiences of developing justice-oriented practices reviewed above. In particular, equity-oriented research highlights the importance of centering both the *assets* and *needs* of young people from minoritized backgrounds instead of focusing only on their needs (Habig et al., 2021; Nasir & Hand, 2008; Vossoughi et al., 2016; Worsley & Roby, 2021).

The key issue this work highlights is that involving groups who are excluded and minoritized by structural inequalities into unchanged STEM learning practices that neither respect nor recognize their own knowledges, practices, assets, or needs can do little to meaningfully redistribute STEM learning opportunities (Dawson, 2019; Lee & Buxton, 2010). In other words, equality requires equity. Situating these approaches to social justice in ISL practice through the lens of relational and redistributive social justice is helpful because the research and practice fields draw on many different ideas, practices, sites, and people. Thus theories of critical pedagogy, funds of knowledge, participatory practice, critical race theory, culturally relevant pedagogy, feminist theories, queer theories, indigenous theories, and more can be found in research on equitable ISL (see, for instance,

Armstrong, 2022; Bang et al., 2014; Habig et al., 2021; Hikuroa et al., 2011; Ladson-Billings, 2021; Miles & Roby, 2022).

One problem worth noting is how economic and epistemic drivers to increase recruitment to STEM and improve STEM knowledge can be intertwined with calls for socially just ISL in ways that may do little to support minoritized communities. These arguments about what we might call the "business case" for equitable ISL can pull social justice work toward the goals of dominant groups. For instance, around the world policies from governments, businesses, and other STEM organizations continue to call for recruitment to the STEM "pipeline" to staff economy boosting STEM professions (Dayalan, 2023; European Commission, 2004; National Audit Office, 2018; Umar, 2019). These calls focus on access and inclusion in two ways. First, recruiting a broader, more diverse range of people into the STEM industries is crucial for increasing the *overall* numbers of STEM students and professionals (see, e.g., Engineering UK, 2021; National Science Foundation, 2021; Walden-Schertz, 2017). Second, increasing diversity within scientific communities will improve the quality of STEM research and its applications (Briggs, 2017; Institute of Physics, 2021). In both visions redistributing access to STEM education and careers is formulated in terms of dominant interests (national economic growth, benefits to the scientific community, STEM knowledge and applications), rather than minoritized groups (Longino, 1990; Osborne & Dillon, 2010; Ramirez et al., 2006; Schiebinger, 2007).

Evidently, it is important to consider carefully how social justice in ISL is understood since even the research discussed briefly in these two literature review sections highlights repeatedly how many competing concerns, tensions, and powerful vested interests play out in this landscape. Thinking with Freire (2006/1970), we suggest it is crucial to understand how the dialectics of oppression/social justice operate within ISL and create (or not) the conditions for social change. Building on Philip and Azevedo's (2017) call for more empirical research into how equity is understood in ISL, the data from this multisite RPP enable us to contribute to research on social justice in ISL by grounding complex questions about inclusion, power, and justice in ISL educators' everyday practices and experiences.

2.3 | Discourse theory

The languages and concepts of social justice are widely used in STEM education and elsewhere, yet how they are understood and enacted varies, as argued above. In this paper we examine social justice in ISL by staying with what shapes educators' practices and, in turn, how they shape and disrupt what is possible to conceptualize and do. Drawing on feminist epistemologies, we note that our commitment in this paper is not to define the "right" way to do discourse analysis, social justice, or equity, but rather to stay with the tensions and incompleteness inherent in working toward equitable practice in everyday lives (Haraway, 2016; Hill Collins, 2000; Sedgewick, 2003). To do this we build on theories of discourse.

A rich array of approaches to discourse exist that vary in theoretical, political and methodological commitments, within and beyond Foucauldian approaches (Diaz-Bone et al., 2007; Wetherell et al., 2001). We work with the Foucauldian notion of power/knowledge as discourse (Foucault, 1972), rather than drawing on the scholarship of discourse in related theories and approaches, such as critical discourse analysis, conversation analysis, sociolinguistics, literacy studies, cultural historical activity theory, or discursive psychology (see, e.g., Edley, 2001; Fairclough, 2003; Lewis, 2006; Lewis & Birr Moje, 2003; Rampton, 2002). While we appreciate these approaches all have much to offer, we found Foucault's work on power/knowledge, augmented with scholarship on Black feminism and queer studies, were key tools for thinking through our research questions and data.

We are interested in how everyday ISL practices are thought about and the possibility of action and change based on this process. For Foucault (1972), discourse authorizes and legitimates what counts, it produces and is productive of knowledge, practices, and power. We are interested in understanding how discourses about social justice structured ISL practices across four different sites and how educators articulated, enacted, negotiated, and subverted these discourses. We augment Foucault's theories with ideas about how discourses might change, focusing on what happens when discourses multiply and the roles of everyday agency, using concepts drawn from queer and Black studies (Hill

Collins, 2000; Sedgewick, 2003). We build too on how Gee (1999) developed Foucault's (1970, 1972, 1981) discourse theory in the context of education, specifically his work on the situated meaning of discourses.

We draw on Foucault's (1970, 1972, 1981) approach to understand discourse as powerful systems constituted by talk, practice, material objects, and ideas (including past/future orientations) that do certain kinds of work in our societies. This concept of discourse provides a way to think about how power is reproduced, resisted, or transformed. For Foucault (1981), discourses are social practices that give our worlds and words meaning. Discourses have some regularity of shape over time, which allows them to be recognizable (Foucault, 1970, 1972, 1981).

Foucault (1972, 1981) argued that discourses are forms of power/knowledge, or meaning, that are systemic, upheld by policies, institutions, and professionalized practices, as well as day-to-day activities. These constellations of meaning need to hang together to constitute the parameters of a recognizable discourse about a given issue—in this case, how social justice is understood in ISL practice. For instance, in an ISL setting discourses about social justice might circulate in team meetings, in new-staff training practices, in marketing materials, funding applications, the physical material of the space, workshop costs, and so on. As such, discourses are more than just language, but distributed across our worlds in symbols, actions, architecture, documents, and infrastructures (Gee, 1999). Power is thus dispersed, though not necessarily evenly. And, as many have noted, from this perspective, so too is resistance (Walkerdine, 1990). Put differently, it is perfectly possible for new staff at an after-school STEM club to simply ignore aspects of their professional training.

Foucault (1981) argued that when discourses become dominant they take on the appearance of truth—this gives them power over alternative ideas or practices. In other words, there is power in which discourses of social justice in ISL hold sway. Tensions between discourses can change established discourses, create multiple discourses, and/or lead to new ones. Discourses are dominant when they determine the socially agreed meaning of a specific issue, in a given time and place (Foucault, 1972; Gee, 1999). But there can be more than one dominant discourse at play, and friction between them can lead to new or different discourse, making space for change (Gee, 1999).

We read Foucault's theory of discourse through more recent work in queer theory and Black studies, to understand the relationships between discourses and sociocultural political contexts, multiplicity, change, and agency to ground our understanding of discourse in educators' everyday lives (Harney & Moten, 2013; Leonardo, 2020; Sedgewick, 2003). As Hill Collins (2000), Spillers (1987), and Sedgewick (2003) show, discourses, or grammar as Spillers terms them, can be multiple, with quite specific instantiations when it comes to race, ethnicity, gender, and/or sexuality. For instance, in terms of STEM education, research demonstrates that multiple discourses operate about who can be a successful scientist in ways that are distinctly marked by discourses of race and gender (Ong, 2005). Tensions between sociocultural political contexts can therefore produce multiple discourses, which may mark people differently, and which might or might not lead to changes in dominant discourses. Sedgewick (2003) argues that multiple discourses might be best understood as lying beside one another, but that this need not imply that they are lying comfortably, are mutually intelligible, or inevitably in tension. As Spillers (1987) and Sedgewick's (2003) work implies, as does that of Foucault (1972), understanding discourse as multiple does not mean all discourses have equal power.

We draw on Hill Collins (2000, p. 265) work in Black feminist theory, particularly her "both/and thinking," to think through the possibilities of multiple discourses, power, agency, and change. Hill Collin's (2000) "both/and" concept explicitly pushes back on binary thinking by combining power/resistance into "both," rather than "either/or" and adding the "and'. In other words, a discourse might *both* attempt to resist an oppressive system while simultaneously shoring it up *and* in doing so create new possibilities for change. This approach focuses on everyday practices, empowerment, and change. Thus, working with Hill Collin's (2000) both/and formulation, we note that discourses about social justice in ISL might *both* sit alongside one another in varying degrees of complementary comfort *and* in competitive or contradictory tension, domination, constraint *and/or* more forms of relation. But how can we understand the role that everyday people play in reproducing both/and changing discourses?

We draw on Sedgewick's (2003) work in queer theory to understand how ISL educator's agency can be found in their everyday practices, practices which are enmeshed within but may also counter and change powerful

discourses. Sedgewick (2003) critiqued what she saw as a tendency to over-rely on negative or paranoid interpretations of texts or events in Foucauldian approaches to discourse. Here, she argued, cynicism afforded a position of superiority and critique—nothing can ever be good enough—and the possibility of change is foreclosed. For instance, a cynical approach might look at the literature reviewed above in this paper and suggest that efforts toward equitable ISL practice are naive (in the face of embedded exclusive systems) or jaded tokenism. Sedgewick (2003) argued the cynical approach frames people as either complicit with a particular discourse or resistant to it. She suggested an alternative approach, that foregrounds everyday agency, might be more useful.

Sedgewick (2003, p. 14) argued that focusing on what she termed "everyday theory" left more room for the complicated, contradictory nuances of people's relationships to discourses. She described this approach as a reparative analysis. A reparative discourse analysis—one that pays attention to surprises, nuances, contradictions, change, and hope—is, for Sedgewick a way to stay with the messiness and complexity of everyday life. In rejecting the view that people are either complicit in or resisting a given discourse, Sedgewick (2003) argued that a reparative analysis makes space to explore how people use the agency available to them to negotiate discourses in more nuanced ways. Indeed, a reparative analysis of the literature reviewed earlier in this paper might note that, although hotly debated, equitable ISL practices evidently are being developed, reflected on, and shared. Sedgewick (2003) also notes that both cynical and reparative discourse analyses can be fruitful, especially in conversation with one another. Importantly, Sedgewick's (2003) concept of reparative analysis approach to discourse allows us to make space for ISL educators' agency in a way that might otherwise be overlooked.

For our final theoretical tool, we return to Gee (1999) and his concept of situated meaning. We use this tool to develop agentic, reparative analyses of how people navigated discourses. Situated meaning is the meaning of a discourse crafted by people in a specific context, for their own purposes. In other words, as Gee (1999, p. 214) puts it, "people actively make meaning for their words in the contexts in which they use language [...] People do not just recover meaning from a passive storage bin in their heads." From this perspective, discourses are recognizable, socially mediated practices that shape how we relate to the world but that we, in turn, can draw on rather than being entirely controlled by, as Sedgewick (2003) suggests. We do not mean to imply that everyone has equal access to social discourses, as argued above, the sociocultural, political nature of discourses means this is not the case. Rather, we use the idea of situated meaning-making as a reparative discourse analysis tool that helps us to locate a sense of agency and context in how educators' relationships with discourses about social justice in ISL (Foucault, 1981; Gee, 1999).

We focus on ISL educators' discourses in their daily work to situate the everyday as a political space, one where power is negotiated, remade, resisted, and/or transformed (Dyck, 2005; Michael, 2006). We locate ISL educators work in what Sedgewick (2003, p. 13) calls the "middle ranges of agency that offer space for effectual creativity and change." That is, in their daily working lives, educators were rarely able to fully control what happened, but nor were they wholly without agency. Instead, as Gee (1999) suggests, we can see how discourses were navigated as sites of on-going struggles for power, which, thinking with Sedgewick (2003) were constantly negotiated through normal, everyday practices, rather than wholly complied with or resisted through high-stakes protests.

To return to our research questions: (1) which discourses shaped social justice practices for ISL educators and, (2), how did educators enact, negotiate, resist, and rework these discourses—this paper contributes conceptually to research on power, discourse, and social justice in ISL and STEM education by situating sometimes abstract questions about power in the everyday work of ISL educators.

3 | METHODS

To address the two research questions above, we draw across 5 years of data generated with educators in four UK sites, based in two cities in the south of England (a zoo, a social enterprise working to support girls and nonbinary young people in STEM, a community digital arts center and a science center). The project was informed by methods from collaborative projects and RPP in education, where educators participated in all stages of the study and had

allocated, and funded time on the project (Gutiérrez et al., 2017; Penuel, 2017; Penuel et al., 2015). Initially, two educators in each site were active partners in the research project. Pairs involved one educator more involved in the management and another more involved in delivering youth programmes. Educators and researchers came from a range of backgrounds in terms of race, ethnicity, class, ability, gender, and sexuality. Over the 5 years, with pandemic-related redundancies, restructuring, and other staff changes, a total of 17 educators were involved in the project across the four UK sites.

3.1 | Research design

RPPs are used in the education sector (among others) to bridge perceived practice/research divides (Gutiérrez et al., 2017; Penuel, 2017). As is common in RPPs, data were generated through collaborative, multimodal methods of research over multiple years (Penuel et al., 2015). A qualitative, multimodal approach was taken to how data were generated within the project to prioritize practice partners' time and support capacity. Data drawn on in this paper were generated in four main ways: (1) through single, pair, or group interviews between educators and researchers; (2) ethnographic fieldwork by researchers at educators' sites, often accompanied by informal "catch-up" interviews; (3) written educator reflections through "portfolio" exercises via google forms, paper, and email; and (4) regular cycles of recorded project workshops focused on both planning and reflection. Additional data took the form of audio and video recordings, as well as field notes from educators visiting one another's sites to share practices and ideas. Where appropriate, organizational documents (such as policy documents, manifestos, or other texts) and/or organizational data (such as numbers of visitors or users) were also shared by educators. Visits and in-person meetings were replaced by emails, phone calls, online conversations, and webinars during the COVID-19 pandemic site closures and travel prohibitions when educators were available between periods of furlough.[4] A hybrid model of data generation emerged when educators were able to return to work and once sites reopened, with fewer in-person meetings and a greater reliance on remote working tools.

The main form of researcher participation in the educators ISL programmes with youth took an ethnographic approach. Drawing on methods from participatory, collaborative, and design-based research as well as action research, researchers' site visits were not undertaken as though they might be a fly on the wall, but rather as active, supportive participants (Anderson & Shattuck, 2012; Bang & Vossoughi, 2016; Kemmis & McTaggart, 2005; Kuhne & Quigley, 1997). These visits were recorded through field notes, audio recordings, and photographs.

Interviews between educators and researchers were carried out throughout the project, following Kvale's (1996) approach to interviews as co-constructed conversations. These were semistructured by researchers, but flexibly designed to follow educators leads, and included one case of an educator interviewing a researcher. In total, 68 interviews were carried out over the 5 years of the project. A further 211 documents were included in the analysis presented in this paper, including fieldnotes, documents shared by educators as part of their "portfolios," as well as notes and recordings from meetings and workshops. As the literature on RPPs suggests, the multimodal portfolios provided a way for educators to record their experiences and ideas in ways that could fit relatively easily into their work (Malorni et al., 2022). The regular cycles of project workshops involved at least one whole UK team meeting per year, with additional site-specific meetings. All in-person and online meetings were audio recorded and transcribed.

3.2 | Analysis

Foucault's legacy in relation to the process of discourse analysis is complex. As Carabine (2001) noted, he left no methodological guidebook for his approach and, as a result, scholars have drawn on his model of power/knowledge in many ways. To code collectively and over time, we needed an analytic method we could share. Drawing on the

discourse theories outlined above, we operationalised Foucault's theory of discourse though an analytic method based on Gee's (1999) and Sedgewick's (2003) approaches. That is, as we outline in more detail below, we looked at patterns of discourse in the data in two key ways; a cynical discourse analysis and a reparative discourse analysis, the latter using Gee's (1999) concept of situated meaning.

The data drawn on in this paper were analyzed initially following an inductive, qualitative approach, followed by a thematic approach based on the theory outlined above. Data were analyzed through iterative cycles by researchers, with initial thematic, inductive coding brought to educator–researcher meetings for discussion and refinement (Miles & Huberman, 1994). The three discourses discussed in this paper can be traced to coding tables from the end of the first year of the project onwards.

Data analysis was undertaken in the following five stages. First, initial codes of the kinds of discourses emerging from educator data were developed into coding frameworks during the first year of the project and refined through discussion with the research team. Second, these tables were added to by Dawson (2023) throughout the second year of the project, in discussion with the research team. Third, in the third year of the project Dawson (2019) carried out an analysis of the data corpus then available with this framework using the NVivo software programme, following approaches developed in qualitative analysis to develop new codes and refine existing ones (Miles & Huberman, 1994). The research team worked in a shared NVivo file to code and refine codes collaboratively. Fourth, in the fifth year of the project, Dawson (2023) added the subsequent 2 years of educator data to the code frame iterated by Dawson (2019), working in the shared NVivo file. This corpus, and the iterative code frame were then analyzed from the theoretical perspective of Foucauldian discourse and Gee's subsequent development of discourse and situated meaning in education (Foucault, 1972, 1981; Gee, 1999). Fifth and finally, the analysis presented here underwent additional feedback from three practice partners and three partner-led workshops held by Dawson (2014, 2019) and Dawson et al. (2019) and, one of which Dawson (2023) was invited to. Because of the size of the corpus, the duration of the project, and the explicit project focus on honoring educators' perspectives, data were analyzed past the point of saturation until all educator data were coded (Bowen, 2008).

Building on the theoretical framework outlined in the previous section, we understood discourse as a key form of meaning-making constituted through material practices, objects, and spaces, as well as talk (Foucault, 1972, 1981; Gee, 1999). In our analyses we, therefore, traced regularities and formations (positions, transformations, functions) across talk, practice, and material artefacts (Gee, 1999). We noted inconsistencies, similarities, contradictions and overlaps between discourses and how they appeared. Drawing on Gee's (1999) analytic methods we looked for discourses and situated meanings of social justice in ISL across the whole educator data corpus, for instance, from interviews to photographs, fieldnotes, reflections, organizational documents, and workshop data. We sought to develop both a cynical *and* reparative analysis reading of the data, building on the theories outlined above. In other words, in line with our two research questions, we looked for the discourses that shaped educators' practices *and* we analyzed how educators in turn shaped, disrupted, or expanded these discourses, through the concept of situated meaning.

The project obtained ethical approval from University College London and adhered to the British Education Research Association's Ethical Guidelines for Educational Research. All names presented here are pseudonyms. To protect educators pseudonymity we have omitted key demographics and other identifiable characteristics. Although the data analyzed was multimodal, to protect pseudonymity we do not share pictures, photographs, or extracts from websites, institutional documents, social media, evaluations, or other searchable or otherwise identifiable text, data, or images.

4 | FINDINGS

Over the 5 years of the project, we found three relatively stable discourses shaped how social justice was understood in ISL practice. Here, we call these (1) "inclusion; for STEM, (2) "inclusion" for the institution, and (3) "inclusion" for minoritized youth. In the first analytic section we answer the first research question: which

discourses shaped social justice practices for ISL educators? We discuss how these discourses operated, as well as the tensions and affordances they created for equitable ISL. Here, we take what Sedgewick (2003) described as a cynical analysis approach. Despite these tensions, we found educators drew on all three discourses to advocate for equitable ISL. As a result, in the second section, we pursue Sedgewick's (2003) reparative discourse analysis approach and we turn to the latter part of our research question: how did educators use, enact, negotiate, resist, and rework the discourses that shaped social justice in ISL? Using Gee's (1999) concept of situated meaning, we discuss how educators used the tools at their disposal—the three main discourses and more—to develop equitable ISL.

4.1 | Three key social justice in ISL discourses navigated by educators

We anticipated variation in discourses around how social justice was understood, discussed, and enacted in ISL across the four sites. The four partner organizations were structurally different in terms of physical size, number of staff, organizational age, STEM focus, key audiences, funding models, and organizational background. To our surprise; however, the three discourses we identified were sufficiently dominant that they structured how equitable ISL was framed, practiced, and discussed even across these arguably significantly different organizations.

The first finding to note here is that discourses of social justice encountered during the project were mainly shaped through the language of inclusion. We found that during the life of the project, the term inclusion was ubiquitous in STEM and ISL policy documents in the United Kingdom, as well as the vocabulary of the institutions and educators involved in the project (including the university). In this sense, it signified a dominant discourse and we reflect that here in how we named the discourses we identified.

Of course, the social justice framework outlined in the literature review and the discourse theorists discussed above subvert notions of even-handed power and complicate what 'inclusion' might mean (not least Foucault, 1981; Hill Collins, 2000; Sedgewick, 2003). These perspectives, along with more targeted critiques, problematize the term "inclusion" as a place holder for equity and social justice (Ahmed, 2012; Bhattacharya, 2018). In particular, the language of inclusion highlights power dynamics between dominant and minoritized groups, where the dominant typically controls the inclusion agenda and shapes it to their own interests (Bhattacharya, 2018; Dawson, 2019, 2023). We retain the term "inclusion" in the discourse analysis that follows to stay true to the empirical data. We note, however, that educators, like the researchers, were alive to the many tensions this language brings with it and those tensions are discussed in what follows.

Perhaps naively, we had anticipated more fluidity in discourses about STEM, ISL, and social justice across this period. The Covid-19 pandemic (2020+) and the international Black Lives Matter protests of 2020 made both structural inequalities and STEM the subject of increased media attention, institutional focus, and personal conversation in the United Kingdom and abroad. Although both the COVID-19 pandemic and Black Lives Matter can be traced through the data, they were framed through the three dominant discourses. As such, we found the apparent stability of these three "inclusion" discourses across institutions and time notable. Each discourse is described and discussed in turn below.

4.1.1 | Inclusion for STEM discourse: "who wants to be a scientist?"

Discourses organize or shape how practices are understood and the possibilities for action as a result (Foucault, 1972). We coded the "inclusion for STEM" discourse where equitable ISL practice was framed as STEM-centric and motivated around recruiting more people for or to STEM. As Madison from the social enterprise put it in an interview, "we try to inspire the next generation into STEM." She added she hoped young people

involved in the school clubs, mentoring, hackathons, and day-long events would think "actually maybe I could become a scientist, ooh, I could become an engineer."

We identified the STEM-centric, "inclusion for STEM" discourse, as the most explicit and by far most prevalent of the three discourses across the project. Fieldnotes show that career talk frequently framed programmes in introductory sessions with, for example, youth at a science center program session being asked "'What is a scientist?' Also who wants to be a scientist?" Inspiring youth to pursue STEM careers was described as a desired outcome by ISL educators, with this statement from Danielle at the zoo being widely echoed by teams at all sites; "if we can inspire someone to go into that [STEM] career, that's brilliant". Not only were programmes infused with STEM recruitment themes, but these ideas were echoed by youth and their families in both fieldwork notes and their feedback to ISL educators. As a result, programme evaluations, especially from the science center and community center, frequently included requests from families for more information about STEM careers. This theme was also echoed in fieldnotes from programme observations and interactions at all four sites. Drawing on Gee (1999) and how he understands discourse in education through Foucault's (1970, 1972, 1981) work, analytically across the data set, we see these feedback loops as minoritized youth and their families taking up the "inclusion for STEM" discourse as a way to legibly participate with ISL activities.

That recruitment to STEM shaped equitable ISL practice echoes earlier research from Tlili (2008) and Feinstein and Meshoulam (2014) who both found that interviewed ISL practitioners saw attracting people to STEM as an important reason for social justice work. Data from this project demonstrate just how strongly "inclusion for STEM" shaped what was possible for equitable ISL, which can seen in all forms of data over 5 years. For instance, programme fieldnotes and interviews show that across the four organizations minoritized youth encountered the following activities: visiting STEM industry settings such as large technology firms; working with STEM professionals at the ISL sites; meeting and researching STEM professionals; engaging in direct STEM career mentoring programmes; receiving specific STEM career skills training, ranging from CV workshops to coding; STEM exhibit design; animal habitat maintenance; and the use of specialized STEM equipment. As you might imagine from such a long list, this comprised the majority of the ISL practices framed as social justice work at all four sites. Furthermore, this STEM careers-focused discourse was echoed across multiple modes of data, from interviews, fieldnotes, educator portfolios, youth and family feedback, meetings, and organizational documents.

Analytically, we can see here the "kit" (Gee, 1999, p. 57) drawn on in this discourse, the kinds of characteristics, framings, artefacts, and symbols repeatedly invoked in ISL activities with minoritized youth across the project. The multimodal data show that the "inclusion for STEM" kit included positive representations of professional scientists, actual STEM professionals, their skills (both general and highly specific), workplaces and projections of STEM career futures, their props (from specialist equipment to lab coats), and their language. Data show this pattern was echoed at all sites. The overwhelming focus on STEM careers structured the terms within which equitable ISL practice could exist.

The extent to which educators framed equitable ISL in relation to the STEM "pipeline" reflects the dominance of the pipeline rhetoric in the literature and policy sectors, which, though critiqued, remains a significant driver for STEM education (Drori, 2004; Lykkegaard & Ulriksen, 2019; Osborne, 2010). ISL educators explicitly linked the STEM "pipeline" to their work, framing equitable practice as opening up STEM careers for minoritized youth. For instance, reflecting on their experiences in the fourth year of the project in a team meeting, Anna from the science center commented on how "hard" many youth had found it to think about STEM careers noting "there's work to be done about increasing representation and diversity within the STEM sector." That minoritized young people are significantly underrepresented in STEM, especially the physical sciences, is well established in research and evidently problematic (Curran & Kitchin, 2019; Dyrberg & Holmegaard, 2019; Moote et al., 2020). The social narrowness of STEM student and professional cohorts is indeed a significant social justice issue and much needs to be done to transform patterns of participation in these educational and professional fields (Basile & Lopez, 2015; Brown, 2021; Wade-Jaimes et al., 2021). As such, the STEM-centric discourse can be understood as overlapping

with the "inclusion for minoritised youth" discourse, especially since some of the evaluation feedback data educators shared from minoritized youth and their families, highlighting their desire to access STEM career support.

The "inclusion for STEM" discourse was not taken up without nuance by educators however. Educators reflected on the limitations of ISL activities that had no capacity to transform wider STEM fields to be more equitable, but were simply designed to support minoritized youth to fit into the STEM pipeline For instance, in an interview Erin from the community digital arts center voiced her frustration at the endurance of established patterns of social advantage saying:

> All the people that you've worked really hard to engage are *still* not going back into the real world having this progression [...] the real world doesn't replicate the world that we've created here, so how do you balance that? [...] I noticed the pattern was that obviously the middle class, white guys are the ones getting the jobs at the end of it.

Erin noted both how hard she has worked to redress the balance in STEM career opportunities and how futile these efforts can feel. We understand STEM-career-oriented practices as important attempts to reorganize access to STEM by cultivating knowledge and skills that support minoritized youth to pursue STEM careers (Archer, Francis, et al., 2022; Fraser & Honneth, 2003; Tan et al., 2013). Like Erin, however, we note too that these practices can be somewhat hollow. This finding echoes previous science education research that critiques the continued dominance of STEM "pipeline" rhetoric in science teaching, not least that this framing works to the detriment of the majority of students who will not enter STEM professions (Lykkegaard & Ulriksen, 2019; Osborne, 2010).

A key issue in analyzing discourse is to pay attention to what ideas or practices particular discourses open or close (Foucault, 1972, 1981; Gee, 1999). Notably, the "inclusion for STEM" discourse sat in tension with other ideas about social justice in our data, particularly 'inclusion for minoritised youth" (see Section 3.1.3). This decentering of minoritized youth we found, was, we suggest problematic in at least two ways. First, centered as it was on the concerns of dominant groups, the "inclusion for STEM" discourse reproduced government and industry concerns about ensuring the next generation of STEM workers (Drori, 2004; Lykkegaard & Ulriksen, 2019; Osborne, 2010; Ramirez et al., 2006). Our analysis shows how minoritized youth were positioned through this discourse as an untapped resource for STEM industries, rather than the other way around. Second, unlike the "inclusion for minoritised youth" discourse (see Section 3.1.3), the STEM-centric discourse was premised on a deficit view of minoritized groups as needing *more* interest in STEM, *more* skills, *more* coaching, and *more* role models. This kind of deficit approach to minoritized youth renders their assets, interests, and joy invisible and, crucially, makes them the locus of change rather than seeking to change inequitable, exclusive, and oppressive systems with dominant STEM practices (Dawson, 2019; Habig et al., 2021; Lee & Buxton, 2010; Worsley & Roby, 2021). We suggest therefore that the prevalence of the "inclusion for STEM" discourse made decoupling equitable practice from recruitment to STEM hard to imagine, narrowing the available choices for how socially just ISL could be understood beyond the logic of STEM industry recruitment.

4.1.2 | Inclusion for the institution: "get more people in the building"

A second key discourse that organized much of the ISL practice in the project positioned such work as *for* the institution. Institutional benefits coalesced around two closely related themes; first, income generation and second, reputation management through visible compliance with equity, diversity, and inclusion (EDI) policies or pressures. These two themes emerged from interviews, fieldnotes, organizational documents, websites and social media, project meetings, and practitioner portfolios. Thinking with Gee (1999) and Foucault (1970, 1972, 1981) about discourses as ways to co-ordinate practices, concepts, and material artefacts like budgets and activities, our data

analysis suggests the key feature of this discourse was its orientation toward institutional needs, instead of, for example, those of STEM or minoritized youth and their communities.

The first facet of this discourse—income generation—structured ISL practice across all sites because, as Erin from the community digital arts center put it during a project meeting, all ISL activities were "funding dependent." Although all partner sites were charities or social enterprises, fieldnotes, project meetings, and interviews show they were shaped by the need to create revenue from participants and visitors, whether directly in terms of entry fees or money spent on site, or indirectly through sponsorship and grant funding. Thus, as previous research has shown, despite their charitable missions, many ISL organizations in the United Kingdom, as elsewhere, are structured through neo-liberal capitalism (Ash, 2022; Feinstein & Meshoulam, 2014; Kawashima, 2006; Tlili, 2008).

Getting more people to the site (whether the site was digital or physical, and whether direct entry fees were involved or not) was seen as both a key goal and measure for equitable practice, echoing previous research on practitioners views of social justice in ISL (Tlili, 2008). This perspective was notable in organizational documents, from project evaluations to documents about future aspirations. Tessa from the science center reflected during fieldwork on the perceived need to always "get more people in the building," noting how she wanted "not just the current people that we are seeing, the quite wealthy, middle class, White people—but all people." Similarly, at the zoo Danielle was adamant in an interview that equitable ISL practice generated revenue, arguing that prayer rooms and additional languages brought in more people, and more people inevitably meant more money:

> when I'm trying to talk about these programmes with other organizations, the one thing we always fall back on is money, but when people sort of start to realise, that equitable practice [...] not only are they sought after by the people with pockets of money, but they generate their own money themselves, it's not difficult.

As these data extracts show, the "inclusion for the institution" discourse limited how equitable ISL could be understood when financial concerns were seen as the primary driver of institutional decision making. We read the data extracts above from Tessa and Danielle as emblematic of how the "inclusion for the institution" shaped equitable practice into a numbers game. Certainly, much needs to be done to change embedded patterns of participation. But the risk of shaping social justice in ISL through this discourse is also evident in these data; it risks commodifying minoritized youth and their communities (Dawson, 2019, 2023; Feinstein & Meshoulam, 2014; Fraser, 2003).

This discourse also positioned equitable ISL practice as an organizational risk if it threatened visitor numbers or finances, a fear educators felt keenly. From the educators' perspective, the sector was strongly shaped by a shared perception of financial constraint, in ways that were remarkably stable before, during, and after the pandemic, despite the specific challenges posed by the pandemic and site closures. This view was echoed in interviews and organizational documents throughout the project as well as fieldnotes and recordings from team meetings, where worries about site closures, staffing, redundancies, project sustainability, and institutional viability were frequently discussed in relation to equitable ISL.

This finding echoes those of Tlili (2008) and Feinstein and Meshoulam (2014), specifically that ISL practitioners perceived a conflict between social justice and financial security. These findings also echo longstanding debates in the ISL and the museum field that have positioned equitable practice in terms of income generation (Dilenschneider, 2020; Friedman, 2007). This theme in fact has long roots, not least as evidenced by museum research in the United States; institutional financial security (and in some cases profit) has long been framed as in conflict with the high costs and low returns of equitable practice (Coffee, 2008; Gurian, 2006). Indeed, in the UK scholarship on the supposed divide between financial security and equitable practice in ISL spaces dates from the New Labour Government's social inclusion policies in the late 1990s (Kawashima, 2006; Levitas, 1998; Sandell, 1998). Some scholars have argued that the tension between neo-liberal capitalism and social justice is a foundational challenge for museums and similar institutions (Ash, 2022; Bennett et al., 2009). In this context, the

data analyzed here suggest this tension is in fact a stable component of the "inclusion for the institution" discourse. Particularly notable too, from these data, is the politics at play when equitable ISL is framed as an existential threat to institutions and jobs. Thus, the "inclusion for the institution" discourse narrows the options for educators trying to advocate for equitable practice by positioning social justice as a threat to the institution, rather than, as others have argued, a route to longer-term sustainability and renewed relevance (Ash, 2022; Dawson & Streicher, 2020).

Before the pandemic, in a meeting at the very start of the project, Kelvin from the zoo noted, "we are all getting squeezed now." He explicitly linked financial pressures to the vulnerability of equitable ISL practice, adding "they'll say, 'well I'd rather Danielle didn't do the [project] sessions because they're not making enough, she should be in the gift shop.'" Kelvin's comments highlight how equitable practices were framed through the "inclusion *for* the institution" discourse as vulnerable to operational concerns about finances. Similarly, 4 years later in a project meeting at the science center, Brendan worried about the sustainability of programmes for minoritized youth because, in his words, "it's not going to be a revenue generator for us." Fieldnotes, meeting recordings, and interviews attest that organization restructures, changes in funding priorities by government and major ISL funders, as well as the long-term effects of site closures created significant financial concerns for an already worried ISL field. Notably, from this perspective, equitable ISL was a peripheral luxury that threatened the organization *unless* it was recast in service to key organizational drivers, in this case, generating revenue from working with minoritized groups and their communities (Dawson, 2019; Leong, 2013).

The second facet of the "inclusion for the institution" discourse arose across the data from interviews, fieldnotes, and organizational documents through the alignment of equitable ISL practice and institutional compliance with EDI pressures and policies, that were often external. Funders' EDI policies and requirements, alongside public movements like the Black Lives Matter protests of 2020 and the explicit social inequalities highlighted by the COVID-19 pandemic in the United Kingdom and elsewhere, meant the organizations were called to commit to equitable practice in one way or another. Fieldnotes and interviews show these calls came from interactions with organizations social media, the press, and the government. These calls were seen as leverage by educators at the science center and the zoo. In an interview, Brendan described public, social media challenges to the whiteness of the science center he worked at, in the wake of the Black Lives Matter protests, as a useful justification for equitable practice:

> one of them was a member, and she said, "I'm a member. You know, I love, [organisation name]. I don't recall seeing a single Black member of staff". It was just sort of, "you're saying this, but what are you actually doing"?

For Brendan, the explicit sense of public accountability and the potential for reputational damage he describes in the extract above contributed to a sense that equitable ISL was valuable to his organization.

Similarly, Bobbi noted in an interview how keen funders were to be associated with the social enterprise and its highly visible, explicitly equitable practice:

> the partners we have are all people that have seen what we're doing and do want to get involved and want to support in some way. We don't pitch.

In this extract, Bobbi flags that being associated with successful, visible equitable ISL practices was valuable to partners across the wider STEM field (many of whom were private sector organizations). These partnerships, in turn, provided financial support for the social enterprise. Fieldnotes show the range of industry brands on display at social enterprise events, highlighting the wide range of partnerships involved and reinforcing Bobbi's point that industry partners benefitted from their involvement. Here again, the "inclusion for the institution" discourse shaped equitable ISL through organizational needs, whether those were about visibly responding to public concerns about racism, reputation, and, again, financial revenue.

We suggest that the "inclusion for the institution" discourse presents an example of what critical race scholar, Bell (1980, 1992, p. 522) termed "interest convergence." In other words, that external and/or public pressure, such as the EDI concerns of funders or discussions about racism on social media, lead to a situation where the needs of minoritized groups and the needs of ISL institutions overlap, such that the same thing—in this case, equitable ISL practice—becomes valuable to both groups, albeit in different ways, as these data highlight. Broadening ISL audiences, visitors, and users to include minoritized groups is clearly an important goal for ISL organizations committed to equitable practices. But we must also think about whose needs are centered in this discourse (Young, 1990).

We suggest that the "inclusion for the institution" discourse reshaped themes of access and redistribution through what scholars have termed racial capitalism—the generation of profit for dominant, historically white organizations through working with racialized and minoritized groups—which limits the potential for equitable practice to create meaningful change (Bhattacharya, 2018; Leong, 2013). Racial capitalism can be seen in this discourse where a variety of minoritized groups were both commodified and framed as risks and where organizational benefitted from visible links to minoritized groups, reputationally and/or financially (Dawson, 2019, 2023). As many scholars have argued, hollow equitable practices, driven only by institutional needs, too often benefit those same institutions, instead of minoritized communities (Ahmed, 2012; Bell, 1980; Bhattacharya, 2018; Dawson, 2019, 2023; Leong, 2013). And, as we discuss in the final results section, it was against these narrow visions that educators constantly advocated for broader visions of what equitable practice might be.

4.1.3 | Inclusion for minoritized youth: "making a difference in young peoples' lives"

The third discourse that shaped social justice in ISL centered on supporting minoritized young people and their communities more broadly. This youth-centric discourse supported educators to surface and value the needs and assets that minoritized youth brought with them, rather than centering the needs of STEM fields and industries or their institutions. We observed this discourse in practice where educators frequently had one-to-one check ins with young people, asked about their lives beyond programmes or projects, discussed the issues they faced, and so on, as shown by fieldnotes at all sites. Fieldnotes, educator portfolios, interviews and meeting recordings show that the emphasis for educators in any given youth interaction was often as much or more on young people's interests, as it was on the STEM theme of a given session. Interestingly, this theme was absent in Tlili's (2008) earlier UK study of ISL professionals perceptions of inclusive practice. It does however, share something in common with the more recent formulation of the "cooperative logics" Feinstein and Meshoulam's (2014, p. 385) found oriented equitable practice for some of the ISL professionals they interviewed in the US, particularly in how community interests, needs, assets and/or views were centered.

Here the "inclusion for minoritised youth" discourse foregrounded young people's agency in multiple ways across the multimodal project data. We saw it in fieldnotes from collaborative or youth-led programme design, formal and informal evaluative feedback, recorded project meetings about future activities and in programmes designed to develop youth confidence and agency, as well as explicit attention to structural inequalities. We coded "inclusion for minoritised youth", like the other discourses, in talk, practice, artefacts, interactions, texts, and practitioner portfolios. Jesse, for example, at the community digital arts center, described in an interview working with input from minoritized youth to best meet their needs', their families' needs, and broader community needs as standard practice, saying, "their voices are being heard and they have a say in helping us design and shape the programmes." Fieldnotes from programme observations and meetings showed the youth-centric discourse was evident where long-standing relationships were in place between whole organizations, educators, schools and communities (whether local and physical or online), as well as where educators were striving to build and maintain these kinds of relationships. The zoo, for example, had enduring relationships with local youth-justice teams and a school for students with special educational needs. The youth-centric discourse was also evident where project

partners held expertise in community work outside of STEM learning contexts, which has in the past been unusual for ISL institutions in the United Kingdom. Educators at three of the four sites, for instance, had no formal STEM qualifications, instead, their training was in youth work or community development.

Crucially, the youth-centric discourse shaped ISL practices around minoritized young people's needs *and* assets, drawing on redistributive and relational models of social justice (Fraser, 2003; Young, 1990). Across the multimodal data set, we found educators focused in multiple ways on supporting minoritized youth, using ISL practice, STEM content, and their organizations as tools for youth development. As Kelvin from the zoo put it during fieldwork:

> I'd say outcomes for them, for me, is that they gain self-confidence [...] Without sounding too cheesy about it. They believe in themselves that they can go on and create something [...] The technical skills they learn are negligible.

What Kelvin terms "self-confidence" in the extract above, we see as akin to youth or community-centered approaches to STEM education, where the needs, assets, backgrounds, interests, joy, and broader worlds of minoritized youth were considered as important as STEM learning (Habig et al., 2021; Vossoughi et al., 2013; Worsley & Roby, 2021). In this discourse, when technical skills were key to activities, we also note parallels here with what some researchers have called critical STEM agency (Archer, Calabrese-Barton, et al., 2022; Barton & Tan, 2010). In other words, the youth-centric discourse framed ISL practices as tools to support minoritized youth to reach their *own* goals, to define for themselves what their needs were and to bring their assets to bear on the work they did. Through this discourse educators were able to expand the practices and meanings of equitable ISL to center minoritized youth. Pre-defined organizational goals or the straitjacket of the STEM pipeline were not the only desirable outcomes.

In fieldwork, recorded project meetings, meeting notes, and educator portfolios, we found educators used this discourse to center minoritized youth in ways that were radically different from the other two discourses. Educators were alive to the tensions between the youth-centric discourse and the other two. For instance, during a recorded accompanied site visit Tessa (from the science center) and Cole (from the zoo) shared stories of frustration at how other colleagues had challenged the epistemic authority of the minoritized youth Tessa and Cole had worked with, questioning the value of their input to STEM exhibits at their sites. Tessa went on to ask:

> it's hard to know what kids get out of it. How are we defining value? What is my role here? [pause] Do they really need more STEM in their life? If I'm asking them what they want and they want to do all other things, why should I insist on science?

Given the taken-for-granted nature of most discourse, we read this as Tessa grappling with the STEM-centric discourse and the youth-centric discourse that shaped her ISL practice (Foucault, 1981; Gee, 1999). In the same conversation, Tessa and Cole also discussed tensions between the youth and community-centric discourse and the commodification-discourse:

> Cole: Do you get any backlash with this work?
>
> Tessa: Oh gosh, yes! The worst thing happened recently on social media. We give refugees free entry and we have refugee programme. And we got people saying – I'm from [city name], why do refugees get to go in free but I don't?

In the dance between these two discourses—"inclusive ISL for minoritised youth" and "inclusive ISL for the institution"—tensions between public accountability, organizational reputation, organizational revenue, and community-centric ISL are evident. Thus, as Gee (1999), Sedgewick (2003), and others note, multiple discourses

may co-exist, but that does not mean they are mutually supportive. Rather, as these extracts suggest, we found that, though it had significant affordances for broadening what equitable ISL could be, the youth-centric discourse ran counter to the two more dominant discourses that foregrounded STEM and organizational needs and was carefully navigated by educators.

As Gee (1999, p. 57) argued, "Discourses are always defined in relationships of complicity and contestation with other Discourses." We build here on Gee (1999), Hill Collins (2000), and Sedgewick (2003) to argue that this third, youth-centric discourse structured the parameters of equitable ISL practice but did so while straining against, contradicting and at times being undermined by the other two discourses. However, drawing on research about equitable practice in terms of youth agency, funds of knowledge, critical race scholarship, and structural inequalities, we see the youth-centric discourse as valuable for broadening the scope of equitable ISL (see, e.g., Archer, Calabrese-Barton, et al., 2022; Barton & Tan, 2010; Bhopal, 2018; DiGiacomo & Gutiérrez, 2016; Worsley & Roby, 2021). Equitable approaches to STEM learning that center minoritized youth, such as culturally relevant pedagogy, are not new (Brown, 2021; Habig et al., 2021; Ladson-Billings, 2021). Our analysis suggests however that while such approaches were not dominant in these ISL settings, their presence represents a significant shift in practice.

4.2 | How educators navigated "inclusive" ISL discourses and constructed new ones

We found the three discourses we identified were more malleable for educators than a cynical discourse analysis alone might suggest. As the section above began to show, educators drew on multiple discourses and, as Gee (1999) has argued, were not simply discourse puppets. Instead, as shown in the previous section, they reflected on, worked around, and sought to adapt the discourses that shaped their work. In this section, we explore our second research question—how did educators enact, negotiate, resist, and rework discourses of social justice in ISL—though a reparative discourse analysis focused on educators' agency, using the concept of situated meaning (Gee, 1999; Hill Collins, 2000; Sedgewick, 2003).

Our data analysis found educators drew on the three key discourses in a range of ways and developed situated meanings for equitable ISL that were more expansive than each dominant discourse alone. Reading these patterns through queer and Black studies, we suggest educators' crafted situated meanings for equitable ISL strategically, creating the context *they* wanted, rather than simply accepting their dominant meanings even if the language of "inclusion" remained (Harney & Moten, 2013; Leonardo, 2020; Sedgewick, 2003). Gee (1999, p. 215) argued that "we assemble 'situated meanings' customized to the contexts we are in and/or are seeking to create [...] We dovetail meanings to our needs." Situated meaning is a useful conceptual tool because, thinking about power with queer theory and Black studies, it allows us to locate discourses in educators' everyday practices and agency, even from positions of relatively little power (Hill Collins, 2000; Ladson-Billings, 2005; Sedgewick, 2003). Our reparative discourse analysis identified two main strategies that educators used to shift the key discourses and create situated meanings for equitable ISL that better suited their purposes, which we discuss next.

In the first educator strategy, educators pragmatically used whichever discourse they felt had the most purchase in a particular situation to advocate for social justice. Danielle from the zoo explained in an interview, for instance, that she felt she often had to frame equitable ISL as "financially viable and socially viable and have benefits elsewhere" to "get the powers that be to go with you on it." Data from across fieldwork, educator portfolios, workshops, interviews, and meetings showed educators drawing on the key discourses described above, even when they did not necessarily align with their views or practices, to achieve their goals (such as, with Danielle, to better support minoritized youth). For instance, field notes show that in project meetings with senior management, even educators devoted to minoritized youth talked in terms of financial revenue, the recruitment concerns of STEM industries, and government or organizational reputation. Thus, although the key discourses, especially the first two, often shaped the terms of reference for equitable ISL, our data analysis across fieldnotes, recorded meetings,

interviews, and portfolios shows that the situated meanings of these discourses were malleable, to a certain extent, in educators' pragmatic hands.

To change the situated meaning of the key discourses educators also created compound discourses for persuasive effect. Across interviews, fieldnotes and project meetings data show educators drew purposefully on multiple, sometimes actively competing aspects of the three key discourses. Staying with Danielle, the interview extracts below give useful illustrations of how she combined the institution-centric discourse with one centered on minoritized youth:

> I think from a more business side of things, having the pressures of having our funding cut and this is something I use in the [international committee] too. So, I say to them even if you don't want to come from a nice place or an altruistic place or just a nice equitable stance, think of the money. All you have to do is provide that space for breast feeding mothers or quiet spaces for autistic children […] To get money in we want to get as many people as possible and the bare bones of STEM education is reaching as many people as possible. So equity just comes so naturally to these two things.

The situated meaning of equitable ISL discourses dances around in Danielle's comments above. The minoritized youth-centric discourse blurs with the institution-centric discourse, commodifying potential future visitors to an imagined ISL space. Equity is firmly yoked to organizational goals around developing audiences for STEM learning and revenue generation.

However, 5 years of project data, from fieldwork accompanying her during her work to recorded project meetings, interviews, and her portfolio reflections, also evidence of how deeply committed Danielle was to visions of social justice in ISL that centered on minoritized youth and social change. She was repeatedly critical of attempts to frame equity and social justice through narrow financial concerns. In light of these contradictions, we read the extract above through Hill Collins' (2000) both/and formulation as illustrative of Danielle working in the middle ranges of her professional agency to mold the key discourses shaping equitable ISL to her own ends (Sedgewick, 2003). She *both* upheld some problematic aspects of a dominant discourse *and* worked to change discourses. As both the first and second extracts from Danielle in this section show, she drew on the key discourses to create situated meanings for equitable ISL with strategic flexibility and pragmatism to persuade others that equitable practices were important (Gee, 1999). We argue therefore that educators actively negotiated the situated meanings of the available discourses discussed above depending on the context, reinscribing equitable ISL into whichever discourse(s) they felt most useful and effective (Gee, 1999; Harney & Moten, 2013). We also suggest that this strategic approach speaks again to the dominance of the first two discourses ("for STEM" and "for the institution") since these were the discourses used to bolster practices already in line with the "inclusion for minoritised youth" discourse.

The second strategy we identified in our reparative discourse analysis involved educators crafting more expansive ideas of equitable ISL, augmenting, and sometimes radically shifting the situated meanings available. Across all four sites and multiple types of data, we found educators creatively reimagined equitable ISL centered *explicitly* on social justice goals such as combatting racist, homophobic, misogynistic, ableist, or classed practices in their work and across their respective ISL fields. Bobbi, for instance, in an interview explained that they worked at the social enterprise specifically because she was appalled by similar organizations that, as she put it, were "only teaching rich kids to code." Similarly, during fieldwork, Eli from the community digital arts center described an upcoming intensive programme for young men focused on digital music technology as something that would "both support them in their careers" and "alert them to the misogynistic culture" of the sector, while working collectively to change that culture. Project meetings, fieldwork, and portfolios showed that at the zoo, animal naming practices were changed to reflect where specific animals came from, challenging long-held anglophone naming practices. Data from fieldwork and project meetings show that three of the four sites developed antiracist ISL activities based

on the Black Lives Matter movement. Racist, sexist, and ableist representational practices across the ISL sector were repeatedly critiqued by educators in interviews, fieldnotes, project meetings, and their portfolios, as were exclusive hiring practices and elitist visitor profiles.

In this second strategy, we found educators purposefully shifted the situated meaning of equitable ISL toward a more expansive framing in service to broader social justice goals and social change through their everyday practices. Here again, we see Hill Collins' (2000) both/and formulation at play; educators both drew on the dominant discourses and created more expansive visions for equitable ISL. We suggest therefore that educators, some of whom identified as coming from minoritized backgrounds while others did not, became what Leonardo (2020, p. 199) termed "critical travellers." That is, the educators took up positions outside or in opposition to their institutions or fields, to do what they felt was meaningfully equitable work in support of minoritized youth.

Educators often described their professional roles and equitable practices in interviews, project meetings, and their portfolios as outliers, whether within their specific field of ISL, broader fields of education, and politics or sometimes within their institutions. Erin, for instance, during fieldwork at the community digital arts center, felt equitable practice and its proponents continued to struggle for recognition and resources at the field-wide level saying:

> Covid happened, and it seems to have thrown everything back in time. Lots of work around that [inclusion] has stopped, I don't know, it's hard.

Drawing on the concepts of the undercommons and critical travelers, developed respectively by Harney and Moten (2013) and Leonardo (2020) to describe the strategies of educators from minoritized backgrounds working toward social justice in dominant institutions, we suggest educators were savvy about how to leverage their often vulnerable positions.

As Hill Collins (2000) argued, it is important to stay alive to how real people navigate power in their everyday lives. We suggest, from the reparative discourse analysis, that educators had their own resources, strategies and routes through the undercommons of their institutions or fields, to develop equitable ISL on their own terms (Harney & Moten, 2013; Sedgewick, 2003). For instance, in an interview in the fourth year of the project, Carla from the science center spoke to what she perceived as the fragility of social justice in ISL, as well as its proponents:

> I sometimes feel like colleagues think we're the inclusion police, you know? I checked with Scott in case I was being oversensitive, but he agreed. We have to be very careful to frame the work as reflective tools rather than critique. Colleagues get defensive. I'd say everyone that works here is left leaning politically, but that might not always come across in their practice. So you get that sense of colleagues saying, "Watch out, it's the inclusion police."

As the extract above demonstrates, Carla was all too aware that discussions about equity, justice, and inclusion in ISL were often unwelcome and uncomfortable. As a result, she had developed an approach that relied on her being sensitive and strategic, to garner support for her work and equitable practice more broadly.

We suggest these excepts are indicative of how educators sometimes felt, to use Harney and Moten's (2013, p. 26) words, that they were "in, but not of" their organizations and/or fields. Drawing across the whole multimodal data set we argue that there is a pattern of educators' being "careful" to advocate for equitable ISL. This carefulness, as Carla put it, is a useful illustration of the middle ground of agency available to them in their everyday work (Sedgewick, 2003). We argue therefore, from the reparative discourse analysis, drawing on Sedgewick (2003), that educators actively assembled situated meanings for social justice in ISL through calculated and creative efforts to sustain equitable ISL, drawing on the three "inclusion" discourses as tools to use in their work and expanding beyond them as necessary. Drawing on research in education, queer and Black studies, we suggest these strategies

represent important sites of struggle, hope, and change (Gee, 1999; Harney & Moten, 2013; Leonardo, 2020; Sedgewick, 2003).

5 | DISCUSSION

This paper contributes conceptually and empirically to research on social justice, STEM education, and ISL by situating sometimes abstract questions about power in cynical and reparative discourse analyses rooted in the everyday work of ISL educators. Foucault (1972, 1981) argued that the material objects, practices, talk, and ideas that makeup discourses shape our lives and that discourses, as a result, are powerful. But understanding how powerful discourses shape, constrain, and/both change ideas and practices in educators' everyday lives is not always obvious. Our findings build on other studies that show ideas and practices about social justice, inclusion and equity in science centers and museums are, in practice, multiple, not always explicit, and can be in conflict with one another (Ash, 2022; Feinstein & Meshoulam, 2014; Tlili, 2008). As a result, our findings highlight the complexity of how social change happens (or not), tracing the dialectic between oppression and social justice through these discourses and their sociopolitical implications (Freire, 2006/1970).

Our findings go further than previous studies by exploring how ISL educators actively navigated these discourses through their day-to-day practices. In answering our first research question (which discourses shaped social justice practices for ISL educators) we found three key discourses shaped equitable ISL: inclusion for STEM, inclusion for the institution, and inclusion for minoritized youth. In answering our second (how did educators enact, negotiate, resist, and rework these discourses) we found educators were strategic and active in their relationships with these discourses, as well as crafting new visions for social justice in ISL.

The research presented here came from one country and was generated during a specific time. Research, theory, and practice show that social justice issues in ISL are multifaceted, always in flux, and context-specific (Dawson 2019, 2023; Fraser, 2003; Hill Collins, 2000; Shea & Sandoval, 2020; Vossoughi et al., 2016). As a result, and as the data presented here demonstrate, how we understand equitable practice in STEM education and ISL more specifically sits in a shifting landscape, whose shape changes across space and time. But that does not mean equitable ISL (or other justice-oriented pedagogies and practices) is a free-for-all, to be claimed by the loudest voices. Rather, it is, we argue, important to understand social justice in ISL in the context of educators' everyday experiences. It is here we see value in combining cynical and reparative analytic approaches to understanding discourse (Sedgewick, 2003).

Of the three discourses we identified—inclusion for STEM, inclusion for the institution and inclusion for minoritized youth—we suggest the first two were more dominant than the third. If we take a cynical analytic approach to these discourses, drawing on Foucault's (1970, 1972, 1981) theory of discourse as power/knowledge, it is questionable whether the first two discourses, when taken on their own, *could* support meaningfully equitable ISL. The first two discourses appeared in line with concepts of redistributive social justice with their emphasis on increasing access to STEM and ISL for minoritized youth (Fraser, 2003; Rawls, 1971). However, they largely centered the needs and interests of dominant political groups, limiting the possibilities available for how social justice in ISL might be understood and enacted, and as a result, limiting the possibilities of sociopolitical change.

Research beyond ISL has shown that social inclusion discourses are often drawn on in efforts to protect dominant interests (Ahmed, 2012; Bhattacharya, 2018). We suggest the first two discourses about social justice in ISL discussed in this paper operated in a similar way. Shaped through these discourses, social justice efforts in ISL are easily reduced to building "new" audiences (or new markets) whether for STEM or for a specific ISL activity (see, for instance, Dilenschneider, 2020; Friedman, 2007). These approaches are ill-equipped to tackle or transform the structural exclusion of "new" audiences (Ash, 2022; Bhattacharya, 2018; Dawson, 2019, 2023). Thus, despite their seeming parallels with models of social justice, particularly redistributive ones, the first two discourses were

organized around historic and contemporary power relations, capitalism, and the interests of dominant groups (Ash, 2022; Dawson, 2019; Feinstein & Meshoulam, 2014; Fraser, 2003).

Notably, the first two discourses sat in significant tension with the third discourse. As discussed earlier, questions about the needs and assets of minoritized youth and their communities in relation to STEM or education were largely absent from the first two discourses. Unless, as critical race scholars have noted elsewhere, the interests of minoritized groups conveniently aligned with those of dominant groups codified in the dominant discourses (Bell, 1980, 1992; Leong, 2013). A cynical analysis would suggest therefore that the three dominant discourses have limited affordances for transforming ISL, or STEM education more broadly, into practices that are meaningfully equitable for minoritized youth, their families, and/or communities.

But what about the reparative discourse analysis? Sedgewick (2003, p. 13, original emphasis) argued that a reparative discourse analysis helps us to focus on the day-to-day of "what is." In answering our second research question we found educators navigated discourses creatively, disruptively, and pragmatically to tailor and embellish the situated meanings of social justice in ISL to support minoritized youth (Gee, 1999; Sedgewick, 2003). Thus, drawing on Sedgewick's (2003) approach, the reparative discourse analysis using the concept of situated meaning showed the tensions between discourses were *generative*.

Despite its less dominant role, we find the sustained, multisite presence of the third discourse, "inclusion for minoritized youth," hopeful. We see this discourse as rooted in the considerable body of work on community-responsive pedagogy, critical pedagogy, critical race theory in education and other justice-oriented pedagogies in STEM, ISL, and community/youth work as it overlaps with equitable ISL (Brown, 2021; DiGiacomo & Gutiérrez, 2016; Habig et al., 2021; King & Pringle, 2019; Ladson-Billings, 2021; Worsley & Roby, 2021). From a dialectic, Freirean perspective, this is the discourse most opposed to the dominant status quo (2006/1970). Drawing on our reparative discourse analysis of situated meaning, we suggest the third discourse significantly shaped social justice in ISL practices across the four sites involved in the project, not least because of the tensions it generated with the first two discourses. A reparative analysis of these discourses therefore illustrates how, despite the limitations of each discourse, educators *could* use them, and go beyond them, to support meaningfully equitable ISL practice.

Taken together, the cynical and reparative analyses illustrate the *both* the limitations *and* potential of discourses about social justice in ISL (Hill Collins, 2000). Our findings add therefore to research exploring equitable pedagogies, STEM education, and ISL, since, as our data analysis attests, educators work was rarely as simple as either upholding a hegemonic discourse or resisting it (Gee, 1999; Sedgewick, 2003; Walkerdine, 1990). Instead, drawing on Hill Collins (2000) and Sedgewick (2003), we have argued that dominant discourses about social justice in ISL were *both* limiting and useful to educators, *and* that educators also crafted more expansive visions for equitable ISL. Importantly, this suggests social change is possible and shows one of the ways that it can happen.

6 | CONCLUSION

This paper contributes to long-standing debates about educational equity, STEM learning and how educators are both shaped by and in turn shape the discourses that surround them, with a focus on ISL. Of course, following the both/and logic used in this paper further, there is much more to learn about the everyday social justice efforts of ISL educators. Just as we have relied on theories of discourse to understand the relationships between everyday, mundane work practices and broader sociopolitical issues, further research organized around theories of social reproduction, activity theories, or figured worlds might offer fruitful insights (Bourdieu & Passeron, 1999; Cole et al., 1997; Holland et al., 2001). Certainly, more research on how ISL educators work with social justice in their everyday lives continues to be urgently needed.

Debates about the balance of structure and agency embedded in our research question are well trodden (Foucault, 1972, 1981; Gee, 1999; Hill Collins, 2000; Sedgewick, 2003). This paper has attempted to wrestle with

the tensions inherent in discourse analysis, focusing on how educators grapple with equitable ISL, to explore the constraints and opportunities they face trying to challenge and change established, exclusive practices in STEM education. While we identified distinct discourses about social justice in ISL in our multisite, longitudinal data set, it was also evident that educators were not simply the puppets of these discourses. Rather, educators strategically navigated the three key discourses we identified, embellished, and combined them such that their tensions became generative for their own equitable practice. We also found educators developed new, more expansive visions for equitable ISL.

Evidently, multiple discourses about social justice in ISL co-exist, but not necessarily in complementary or wholly incompatible ways. These ideas, we note, look and feel different at different local, national, and international scales, as well as over time. We suggest therefore that staying attuned to the incompleteness inherent in understanding and developing equitable practice provides a useful way to understand what actually happens (Haraway, 2016; Hill Collins, 2000; Sedgewick, 2003). Dominant, socially agreed-upon discourses about social justice are, of course, politically powerful. Our findings demonstrate that dominant discourses around equitable ISL warrant careful consideration; the discourses we identified structure ISL along quite different lines, bring into being quite different visions of STEM learning and its outcomes, imagine differently organized societies, and different futures, and empower different people. We saw too how ISL educators were not helpless in the face of these discourses. Understanding how ideas about social justice play out in practice is crucial then, if we hope to continue to support educational equity, in ISL, in STEM education, and beyond.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

Data supporting this study are not publicly available due to potential commercial sensitivity and the impossibility of fully pseudonymizing the full multimodal data set.

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ENDNOTES

[1] A pseudonym for an educator involved in the research this paper draws on.

[2] In the United Kingdom, recent years have seen an increase in practitioners from arts and cultural sectors self-publishing damning accounts of their experiences of institutional equality, diversity, and inclusion work (see, e.g., Barbican Stories, 2021; Cisneros, 2018; Desai, 2020). We do not know of any comparable public reports from ISL practitioners in the United Kingdom, but our collective experiences suggest they share similar experiences and frustrations.

[3] Case studies published by ISL organizations appear to come predominantly (though not exclusively) from the United States. We suggest this is likely a result of the National Science Foundation's long-term funding of research in ISL in the United States, a model that has not been taken up widely internationally, resulting in few comparable studies led by ISL organizations in other countries. Certainly in the UK funding for ISL research has been piecemeal at best.

[4] The middle of this project coincided with the COVID-19 pandemic and subsequent closures of public sites in the United Kingdom including the physical spaces the four practice partners worked in. The UK government's furlough scheme was open to partner sites and meant that when taken up, partners were not eligible to work for large periods of time in 2020 and 2021.

REFERENCES

Achiam, M., & Holmegaard, H. T. (2017). Informal science education and gender inclusion. In L. S. Heuling (Ed.), *Embracing the other. How the inclusive classroom brings fresh ideas to science and education* (pp. 32–40). Flensburg University Press.

Achiam, M., & Sølberg, J. (2017). Nine meta-functions for science museums and science centres. *Museum Management and Curatorship*, *32*(2), 123–143.

Adams, J. D. (2007). The historical context of science and education at the American museum of natural history. *Cultural Studies of Science Education*, *2*(2), 393–440.

Aguirre, C. (2014). Science centers. Which role can they play to participate in a city social reconstruction? *Journal of Science Communication*, *13*(2), C04.

Ahmed, S. (2012). *On being included: Racism and diversity in institutional life*. Duke University Press.

Anderson, T., & Shattuck, J. (2012). Design-based research: A decade of progress in education research? *Educational Researcher*, *41*(1), 16–25.

Archer, L., Calabrese-Barton, A. M., Dawson, E., Godec, S., Mau, A., & Patel, U. (2022). Fun moments or consequential expeirences? A model for conceptualising and researching equitable youth outcomes from informal STEM learning. *Cultural Studies of Science Education*, *17*, 405–438.

Archer, L., Francis, B., Watson, E., Henderson, M., Holmegaard, H., & MacLeod, E. (2022). Reasons for not/choosing chemistry: Why advanced level chemistry students in England do/not pursue chemistry undergraduate degrees. *Journal of Research in Science Teaching*, *60*, 978–1013.

Armstrong, E. S. (2022). Towards queer tours in science and technology museums. *Museum and Society*, *20*(2), 205–220.

Ash, D. (2022). *Reculturing museums: Embrace conflict, create change*. Routledge.

Ash, D., & Lombana, J. (2011). Reculturing museums: Scaffolding towards equitable mediation in informal settings, *Paper presented at the National Association for Research in Science Teaching, Orlando, FL*.

Ash, D., & Lombana, J. (2012). Methodologies for reflective practice and Museum Educator research: The role of "noticing" and responding. In D. Ash, J. Rahm, & L. M. Melber (Eds.), *Putting theory into practice: Tools for research in informal settings* (pp. 29–52). Sense Publishers.

Bang, M., Curley, L., Kessel, A., Marin, A., Suzukovich, E. S., & Strack, G. (2014). Muskrat theories, tobacco in the streets, and living Chicago as indigenous land. *Environmental Education Research*, *20*(1), 37–55.

Bang, M., & Vossoughi, S. (2016). Participatory design research and educational justice: Studying learning and relations within social change making. *Cognition and Instruction*, *34*(3), 173–193.

Barbican Stories. (2021). Barbican Stories. https://www.barbicanstories.com

Barton, A. C., & Tan, E. (2010). We Be Burnin'! Agency, identity, and science learning. *Journal of the Learning Sciences*, *19*(2), 187–229. https://doi.org/10.1080/10508400903530044

Basile, V., & Lopez, E. (2015). And still I see no changes: Enduring views of students of color in science and mathematics education policy reports. *Science Education*, *99*(3), 519–548.

Bell, D. A. (1980). Brown v. board of education and the interest- convergence dilemma. *Harvard Law Review*, *93*(3), 518–533.

Bell, D. A. (1992). *Faces at the bottom of the well: The permanence of racism*. Basic Books.

Bell, P., Lewenstein, B., Shouse, A. W., & Feder, M. A. (2009). *Learning science in informal environments: People, places, and pursuits*. The National Academies Press.

Bennett, T., Savage, M., Silva, E., Warde, A., Gayo-Cal, M., & Wright, D. (2009). *Culture, class, distinction*. Routledge.

Bevan, B., Calabrese Barton, A., & Garibay, C. (2018). Broadening perspectives on broadening participation in STEM: A summary report. https://www.informalscience.org/sites/default/files/BPreport.pdf

Bevan, B., Garibay, C., & Mayas, R. (2022). Vivious cycles: Museums marginalize the museum educators they hire to engage marginalzed communities. In B. Bevan & B. Ramos (Eds.), *Theorizing equity in the museum: Intergrating perspectives from research and practice* (pp. 111–127). Routledge.

Bevan, B., & Ramos, B. (Eds.). (2022). *Theorizing equity in the museum: Integrating perspectives from research and practice*. Routledge.

Bhattacharya, G. (2018). *Rethinking racial capitalism: Questions of reproduction and survival*. Rowman and Littlefield International.

Bhopal, K. (2018). *White privilege: The myth of a post-racial society*. Polity Press.

Bourdieu, P., & Passeron, J.-C. (1999). *Reproduction in education, society and culture*. Sage.

Bowen, G. A. (2008). Naturalistic inquiry and the saturation concept: A research note. *Qualitative Research*, 8(1), 137–152.

Briggs, C. (2017). The policy of STEM diversity: Diversifying STEM programs in higher education. *Journal of STEM Education*, 17(4).

Brown, B. A. (2021). *Science in the city: Culturally relevant STEM education*. Harvard Education Press.

Burgess, T., & Patterson Williams, A. (2022). Utilizing theory to elucidate the work of creating equity for transformation within the science classroom. *Science Education*, 106(5), 1071–1083.

Canfield, K. N., Menezes, S., Matsuda, S. B., Moore, A., Mosley Austin, A. N., Dewsbury, B. M., Feliú-Mójer, M. I., McDuffie, K. W. B., Moore, K., Reich, C. A., Smith, H. M., & Taylor, C. (2020). Science communication demands a critical approach that centers inclusion, equity, and intersectionality. *Frontiers in Communication*, 5(2), 1–8.

Carabine, J. (2001). Unmarried motherhood 1830-1990: A geneaological analysis. In M. Wetherell, S. Taylor, & S. J. Yates (Eds.), *Discourse as data: A guide for analysis*, (pp. 267–310). Sage.

Carlone, H. B., Haun-Frank, J., & Webb, A. (2011). Assessing equity beyond knowledge- and skills-based outcomes: A comparative ethnography of two fourth-grade reform-based science classrooms. *Journal of Research in Science Teaching*, 48(5), 459–485.

Cisneros, T. (2018). Document 0. Agency for Agency. http://www.agencyforagency.com/writing.html

Coffee, K. (2008). Cultural inclusion, exclusion and the formative roles of museums. *Museum Management and Curatorship*, 23(3), 261–279. https://doi.org/10.1080/09647770802234078

Cole, M., Engeström, Y., & Vasquez, O. (1997). *Mind, culture and activity*. Cambridge University Press.

Curran, F. C., & Kitchin, J. (2019). Why are the early elementary race/ethnicity test score gaps in science larger than those in reading or mathematics? National evidence on the importance of language and immigration context in explaining the gap-in-gaps. *Science Education*, 103(3), 477–502.

Dawson, E. (2014). "Not designed for us": How science museums and science centres socially exclude low-income, minority ethnic groups. *Science Education*, 98(6), 981–1008.

Dawson, E. (2019). *Equity, exclusion & everyday science learning: The experiences of minoritised groups*. Routledge.

Dawson, E. (2023). Social inclusion. In F. Mairesse (Ed.), *ICOM dictionary of museology* (pp. 313–315). Routledge & Armand Colin.

Dawson, E., Archer, L., Seakins, A., DeWitt, J., Godec, S., King, H., Mau, A., & Nomikou, E. (2019). Selfies at a science museum: Exploring girls' identity performances in a science learning settings. *Gender and Education*, 32(5), 664–681.

Dawson, E., & Streicher, B. (2020). Responding to the pandemic: A social justice perspective. *Spokes*, 63, 1–8.

Dayalan, N. (2023). Partnering for progress. https://www.rolls-royce.com/country-sites/india/discover/2018/creating-indias-next-generation-of-stem-talent.aspx

Desai, J. (2020). 'This work isn't for us'. Google docs. https://heystacks.com/doc/337/this-work-isnt-for-us–by-jemma-desai

Diaz-Bone, R., Bührmann, A. D., Gutiérrez Rodríguez, E., Schneider, W., Kendall, G., & Tirado, F. (2007). The field of Foucauldian discourse analysis: Structures, developments and perspectives. *Forum: Qualitative Social Research*, 8(2), 1–26. https://www.qualitative-research.net/index.php/fqs/article/view/234/518

DiGiacomo, D. K., & Gutiérrez, K. D. (2016). Relational equity as a design tool within making and tinkering activities. *Mind, Culture, and Activity*, 23(2), 141–153.

Dilenschneider, C. (2020). Intent to visit by household income: What it means for reopening. https://www.colleendilen.com/2020/04/29/intent-to-visit-by-household-income-what-it-means-for-reopening-data/

Drori, G. S. (2004). Science education and economic development: Trends, relationships, and research agenda. In J. Gilbert (Ed.), *The RoutledgeFalmer reader in science education* (pp. 22–38). RoutledgeFalmer.

Durall, E., Perry, S., Hurley, M., Kapros, E., & Leinonen, T. (2021). Co-designing for equity in informal science learning: A proof-of-concept study of design principles. *Frontiers in Education*, 6, 1–6.

Dyck, I. (2005). Feminist geography, the 'everyday', and local–global relations: Hidden spaces of place-making. *Canadian Geographies*, 49(3), 233–243.

Dyrberg, N. R., & Holmegaard, H. T. (2019). Motivational patterns in STEM education: A self-determination perspective on first year courses. *Research in Science & Technological Education*, 37(1), 90–109.

Edley, N. (2001). Analysing masculinity: Interpretive repertoires, ideological dilemmas and subject positions. In M. Wetherell, S. Taylor, & S. J. Yates (Eds.), *Discourse as data* (pp. 189–228). Sage.

Engineering UK. (2021). *Securing the future: STEM careers provision in schools and colleges in England*.

European Commission. (2004). Europe needs more scientists: Report by the high level group on increasing human resources for science and technology. https://ec.europa.eu/commission/presscorner/detail/en/IP_04_444

Fairclough, N. (2003). *Analysing discourse: Textual analysis for social research*. Routledge.

Falk, J., & Dierking, L. (2010). The 95 percent solution. *American Scientist*, *98*, 486–493.

Feinstein, N. W., & Meshoulam, D. (2014). Science for what public? Addressing equity in American science museums and science centers. *Journal of Research in Science Teaching*, *51*(3), 368–394.

Finley, F., Lawrenz, F., & Heller, P. (1992). A summary of research in science education—1990. *Science Education*, *76*(3), 239–281.

Fortney, B. S., Morrison, D., Rodriguez, A. J., & Upadhyay, B. (2019). Equity in science teacher education: Toward an expanded definition. *Cultural Studies of Science Education*, *14*(2), 259–263.

Foucault, M. (1970). *The order of things*. Routledge.

Foucault, M. (1972). In A. M. Sheridan-Smith (Ed. & Trans.), *The archaeology of knowledge*. Tavistock Publications Limited.

Foucault, M. (1981). The order of discourse. In R. Young (Ed.), *Untying the text: A post-structural reader* (pp. 51–78). Routledge.

Fraser, N. (2003). Social justice in the age of identity politics: Redistribution, recognition, and participation. In N. Fraser & A. Honneth (Eds.), *Redistribution or recognition? A political-philosophical exchange* (pp. 7–109). Verso.

Fraser, N., & Honneth, A. (2003). *Redistribution or recognition? A political-philosophical exchange*. Verso.

Freire, P. (2006). *Pedagogy of the oppressed*. The Continuum International Publishing Group Inc. (Original work published 1970).

Friedman, A. J. (2007). The great sustainability challenge: How visitor studies can save cultural institutions in the 21st century. *Visitor Studies*, *10*(1), 3–12.

Garcia-Luis, V., & Dancstep, T. (2019). Straight from the girls: The importance of incorporating the EDGE design attributes at exhibits. *Curator: The Museum Journal*, *62*(2), 195–221.

Garibay, C., & Huerta Migus, L. (2014). The inclusive museum: A framework for sustainable and authentic institutional change. https://ccliexperience.org/wp-content/uploads/2022/08/CCLI-Framework-for-Inclusion-Paper.pdf

Gee, J. P. (1999). *An introduction to discourse analysis: Theory and method*. Routledge.

Golding, V. (2009). *Learning at the museum frontiers: Identity, race and power*. Ashgate Publishing Company.

Gonsalves, A., Rahm, J., & Carvalho, A. (2013). "We could think of things that could be science": Girls' re-figuring of science in an out-of-school-time club. *Journal of Research in Science Teaching*, *50*, 1068–1097.

Gurian, E. (2006). *Civilizing the museum: The collected writings of Elaine Heumann Gurian*. Routledge.

Gutiérrez, K. D., Cortes, K., Cortez, A., DiGiacomo, D., Higgs, J., Johnson, P., Ramón Lizárraga, J., Mendoza, E., Tien, J., & Vakil, S. (2017). Replacing representation with imagination: Finding ingenuity in everyday practices. *Review of Research in Education*, *41*(1), 30–60.

Gutwill, J. P., Chien, H.-Y., Lani, S., Winterheld, H., Miller, L., & Garibay, C. (2022). Creating middle ground: Transforming outdoor informal learning landscapes. *Curator: The Museum Journal*, *65*(4), 869–886.

Habig, B., Gupta, P., & Adams, J. D. (2021). Disrupting deficit narratives in informal science education: Applying community cultural wealth theory to youth learning and engagement. *Cultural Studies of Science Education*, *16*(2), 509–548.

Haraway, D. (2016). *Staying with the trouble: Making kin in the Chthulucene*. Duke University Press.

Harney, S., & Moten, F. (2013). *The Undercommons: Fugitive planning and Black study*. Minor Compositions.

Hikuroa, D., Slade, A., & Gravley, D. (2011). Implementing Māori indigenous knowledge (mātauranga) in a scientific paradigm: Restoring the Mauri to Te Kete Poutama. *MAI Review*, *3*, 1–9.

Hill Collins, P. (2000). *Black feminist thought: Knowledge, consciousness, and the politics of empowerment*. Routledge.

Hinojosa, L., Swisher, E., & Garneau, N. (2021). The organization of informal pathways into STEM: Designing towards equity. *International Journal of Science Education*, *43*(5), 737–759.

Holland, D., Skinner, D., Lachiotte, Jr., W., & Cain, C. (2001). *Identity and agency in cultural worlds*. Harvard University Press.

Institute of Physics. (2021). Budget 21: IOP urges government to focus on skills to drive science innovation. https://www.iop.org/about/news/budget-21-IOP-urges-government-to-focus-on-science-skills#gref

Jennings, G., & Jones-Rizzi, J. (2017). Museums, White privilege and diversity: A systematic perspective, *Dimensions* (pp. 63–74). https://www.museumcommons.com/wp-content/uploads/2017/03/Dimensions-Diversity-Special-Edition_JenningsJonesRizzi.pdf

Kawashima, N. (2006). Audience development and social inclusion in Britain. *International Journal of Cultural Policy*, *12*(1), 55–72.

Kayumova, S., & Dou, R. (2022). Equity and justice in science education: Toward a pluriverse of multiple identities and onto-epistemologies. *Science Education*, *106*(5), 1097–1117.

Kemmis, S., & McTaggart, R. (2005). Participatory action research. In N. K. Denzin & Y. S. Lincoln (Eds.), *The Sage handbook of qualitative research* (pp. 559–603). Sage.

King, N. S., Collier, Z., Johnson, B. G., Acosta, M., & Southwell, C. N. (2021). Determinants of Black families' access to a community-based STEM program: A latent class analysis. *Science Education*, *105*(6), 1100–1125.

King, N. S., & Pringle, R. M. (2019). Black girls speak STEM: Counterstories of informal and formal learning experiences. *Journal of Research in Science Teaching*, *56*(5), 539–569.

Kuhne, G. W., & Quigley, B. A. (1997). Understanding and using action research in practice settings. *New Directions for Adult and Continuing Education*, *1997*, 23–40.

Kvale, S. (1996). *InterViews*. Sage.

Ladson-Billings, G. (2005). The evolving role of critical race theory in educational scholarship. *Race Ethnicity and Education*, *8*(1), 115–119.

Ladson-Billings, G. (2021). *Culturally relevant pedagogy: Asking a different question*. Teachers College Press.

Lee, O., & Buxton, C. A. (2010). *Diversity and equity in science education: Research, policy, and practice*. Teachers College Press.

Leonardo, Z. (2020). *Edward said and education*. Routledge.

Leong, N. (2013). Racial capitalism. *Harvard Law Review*, *126*(8), 2153–2226.

Letourneau, S. M., Bennett, D., McMillan Culp, K., Mohabir, P., Schloss, D., Liu, C. J., & Honey, M. (2021). A shift in authority: Applying transformational and distributed leadership models to create inclusive informal STEM learning environments. *Curator: The Museum Journal*, *64*(2), 363–382.

Levitas, R. (1998). *The inclusive society?* Palgrave.

Lewis, C. (2006). At last: "What's Discourse Got to Do with It?" A meditation on critical discourse analysis in literacy research. *Research in the Teaching of English*, *40*(3), 373–379.

Lewis, C., & Birr Moje, E. (2003). Sociocultural perspecitves meet critical theories: Producing knowledge through multiple frameworks. *International Journal of Learning*, *10*, 1979–1995.

Longino, H. E. (1990). *Science as social knowledge: Values and objectivity in scientific inquiry*. Princeton University Press.

Lykkegaard, E., & Ulriksen, L. (2019). In and out of the STEM pipeline—A longitudinal study of a misleading metaphor. *International Journal of Science Education*, *41*(12), 1600–1625.

Malorni, A., Diaz, A., Spencer, M. S., & Jones, T. (2022). Collaborative autoethnography as a tool for research–practice partnerships: Facilitating self and school transformation. *Qualitative Social Work*, *22*, 1–20.

Michael, M. (2006). *Technoscience and everyday life: The complex simplicities of the mundane*. Open University Press.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis* (2nd ed.). Sage.

Miles, M. L., & Roby, R. S. (2022). Black liberatory science education: Positioning Black youth as science learners through recognizing brilliance. *Cultural Studies of Science Education*, *17*(1), 177–198.

Moote, J., Archer, L., DeWitt, J., & Macleod, E. (2020). Comparing students' engineering and science aspirations from age 10 to 16: Investigating the role of gender, ethnicity, cultural capital and attitudinal factors. *Journal of Engineering Education*, *109*(1), 34–51.

Nasir, N. S., & Hand, V. (2008). From the court to the classroom: Opportunities for engagement, learning, and identity in basketball and classroom mathematics. *Journal of the Learning Sciences*, *17*(2), 143–179.

National Audit Office. (2018). *Delivering STEM (science, technology, engineering and mathematics) skills for the economy*.

National Science Foundation. (2021). *The STEM labor force of today: Scientists, engineers and skilled technical workers. Science and Engineering Indicators 2022*.

Ong, M. (2005). Body projects of young women of color in physics: Intersections of gender, race, and science. *Social Problems*, *52*(4), 593–617.

Osborne, J. (2010). Science for citizenship. In J. Osborne & J. Dillon (Eds.), *Good pratice in science teaching: What research has to say* (2nd ed., pp. 46–67). Open University Press.

Osborne, J. & Dillon, J., (Eds.). (2010). *Good practice in science teaching: What research has to say*. Open University Press.

Patiño Barba, M. D. L., Del Castillo, J. P. G., & Massarani, L. (2019). Public engagement in science: Mapping out and understanding the practice of science communicaiton in Latin America. *Annals of the Brazilian Academy of Sciences*, *91*(1), 1–16.

Penuel, W. R. (2017). Research-practice partnerships as a strategy for promoting equitable science teaching and learning through leveraging everyday science. *Science Education*, *101*(4), 520–525.

Penuel, W. R., Allen, A.-R., Coburn, C. E., & Farrell, C. (2015). Conceptualizing research–practice partnerships as joint work at boundaries. *Journal of Education for Students Placed at Risk*, *20*(1–2), 182–197.

Philip, T. M., & Azevedo, F. S. (2017). Everyday science learning and equity: Mapping the contested terrain. *Science Education*, *101*(4), 526–532.

Polino, C., & Muñoz, A. (2018). Public perception of science and technology in Argentina 2003–2015: Longitudinal and structural analysis, In M. Bauer, P. Pansegrau, & R. Shukla (Eds.), *The cultural authority of science* (pp. 278–298) Routledge.

Rahm, J. (2010). *Science in the making at the margin: A multisited ethnography of learning and becoming in an afterschool program, a garden and a math and science upward bound program*. Sense Publishers.

Ramirez, F. O., Luo, X., Schofer, E., & Meyer, J. W. (2006). Student achievement and national economic growth. *American Journal of Education*, *113*(1), 1–29.

Rampton, B. (2002). Methodology in the analysis of classroom discourse. *Applied Linguistics*, *23*(3), 373–392.

Rawls, J. (1971). *A theory of justice*. Harvard University Press.

Rende, K., Fromson, K., Jones, M. G., & Ennes, M. (2021). The privilege of low pay: Informal educators' perspectives on workforce equity and diversity. *Journal of Museum Education*, *46*(4), 430–440.

Sandell, R. (1998). Museums as agents of social inclusion. *Museum Management and Curatorship*, *17*(4), 401–418.

Schiebinger, L. (2007). Getting more women into science: Knowledge issues. *Harvard Journal of Law and Gender*, *30*, 365–378.

Sedgewick, K. E. (2003). *Touching feeling: Affect, pedagogy, performativity*. Duke University Press.

Settlage, J., & Williams, B. A. (2022). Equity-centered science education: The origin story of this special issue. *Science Education*, *106*(5), 1013–1020.

Sharpe, C. (2016). *In the wake: On blackness and being*. Duke University Press.

Shea, M. V., & Sandoval, J. (2020). Using historical and political understanding to design for equity in science education. *Science Education*, *104*(1), 27–49.

Spillers, H. J. (1987). Mama's Baby, Papa's Maybe: An American grammar book. *Diacritics*, *17*(2), 64. https://doi.org/10.2307/464747

Tan, E., Calabrese Barton, A., Kang, H., & O'Neill, T. (2013). Desiring a career in STEM-related fields: How middle school girls articulate and negotiate identities-in-practice in science. *Journal of Research in Science Teaching*, *50*(10), 1143–1179.

Tlili, A. (2008). Behind the policy mantra of the inclusive museum: Receptions of social exclusion and inclusion in museums and science centres. *Cultural Sociology*, *2*(1), 123–147.

Tran, L. U., & Gupta, P. (2021). Rebuilding our teams to be critically conscious in our educational work. *International Journal of Informal Science and Environmental Learning*, *1*, 41–62.

Tran, L. U., Gupta, P., & Bader, D. (2019). Redefining professional learning for museum education. *Journal of Museum Education*, *44*(2), 135–146.

Umar, Y. (2019). STEM education as a catalyst for national development: Problems and prospects in Nigeria. *International Learning Science and Mathematics Journal*, *14*, 48–59.

Vossoughi, S., Escudé, M., Kong, F., & Hooper, P. (2013). Tinkering, learning and equity in the after-school setting, *Paper presented at the Fablearn*, *Stanford University, California*.

Vossoughi, S., Hooper, P. K., & Escudé, M. (2016). Making through the lens of culture and power: Toward transformative visions for educational equity. *Harvard Educational Review*, *86*(2), 206–232.

Wade-Jaimes, K., King, N. S., & Schwartz, R. (2021). "You could like science and not be a science person": Black girls' negotiation of space and identity in science. *Science Education*, *105*(5), 855–879.

Walden-Schertz, J. (2017). Stronger together: Plugging the leaks in the STEM development pipeline. https://bangkok.unesco.org/content/stronger-together-plugging-leaks-stem-development-pipeline

Walkerdine, V. (1990). *Schoolgirl fictions*. Verso.

Wetherell, M., Taylor, S., & Yates, S. J. (2001). Introduction. In M. Wetherell, S. Taylor, & J. S. Yates (Eds.), *Discourse as data: A guide for analysis* (pp. i–iii). Open University Press.

Worsley, T. D., & Roby, R. S. (2021). Fostering spaces for Black joy in STEM-rich making and beyond. *Journal of Effective Teaching in Higher Education*, *4*(2), 118–134.

Young, I. M. (1990). *Justice and the politics of difference*. Princeton University Press.