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Complex pathways within nested systems: Exploring approaches to centering equity in peer review

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Abstract

In this essay, I explore some of the insights provided in a set of three manuscripts that focus on centering equity in peer review, authored by Bancroft, Ryoo and Miles, Nkrumah and Mutegi, and Marshall and Salter. I consider various aspects of their arguments, highlighting implications for the procedures and norms of journals and funding organizations and questions for further consideration. Drawing on their findings and analyses, I discuss various recommendations, such as the need to change the rules and norms of peer review to be more equitable, to ensure that reviews are free from race, ethnicity, gender, and other kinds of identity-related biases, to work towards equitable distribution of the resources, such as advising, mentoring, and valuable feedback, that support fair reviewing, and to establish criteria and rubrics that support research that is conducted in collaboration with communities marginalized in science education. In addition, I raise issues for further consideration, including the evolving relationship between "equity" and "merit" with regard to peer review and the need for centering equity in ways that allow for discussion, debate, and development of the field.

KEYWORDS

bias, equity, identity, peer review, science education

1 | INTRODUCTION

The process of peer review has been described as a “gatekeeper” to having one's work published and obtaining grants (e.g., Hojat et al., 2003). A publication record is a vital step to being accepted as a scholar within a particular field, opening the door to various types of opportunities. The tenure process within most institutions of higher education requires publications, sometimes in particular quantities and/or levels of status as measured by impact factor. A publication record can, therefore, be seen as a form of symbolic capital that directly translates into economic capital, enabling aspiring academics to obtain and maintain their positions. Peer review is also used in applications to present at conferences, which enables scholars to participate in the community with others and showcase their work. Furthermore, the peer-review process is used to acquire grants which allow scholars to realize their visions and goals within the field.

Inherent to the process of peer review seems to be several assumptions, including that 1) manuscripts vary in their merit; 2) merit should be the basis of distributing funds and/or space in a journal; 3) it is complex to judge the merit of scholarly work and endeavors, therefore a simple rubric will not suffice; 4) people's views of merit will vary; and 5) there needs to be a fair process by which merit is determined. The idea behind using peer review to evaluate manuscripts and proposals is that colleagues are the best ones to judge the merit. As Eisenhart (2002, p. 243) points out, some of the alternatives to peer review, such as lotteries, quotas, invitations, or relying on networks, “violate the principle that research and scholarship should be evaluated and recognized on their merits, not on their social prestige or connections.”

A review produced by any particular “peer” can be considered an assessment of merit, and therefore a key to entry into the professional community. Yet one particular review is not just a static judgment by an authority figure but is a piece of a larger process that involves interactions with others who may disagree. The review process entails events in which peers within a field attempt to create, solidify, and push boundaries of meaning. For example, a manuscript may receive mixed reviews, and the areas of dispute and overlap between reviewers are then used by editors in making decisions. The reviewers may be informed about the editors' decisions, and sometimes are able to read each other's comments on the same manuscript. Through these events, the peers can gain insight into each other's perspectives on the same manuscript and may be moved in other directions in their thinking. In my own work as a reviewer, I find valuable the process of reading others' reviews of the same manuscripts and observing the commonalities and differences. In addition, the author is also able to read a variety of reviews and consider the different perspectives of the reviewers as they revise.

One set of reviews is not enough to “determine” merit within the field, as any field may have numerous subgroups, with different judgments of merit that may relate to their background, commitments, and inclinations. An author may take a rejected manuscript and send it elsewhere, with the possibility of acceptance if it is a better match with a different segment of the professional community. In addition, there are some elements of chance in the review process, as a manuscript could be sent to a reviewer that has a specific bias against that type of work. When functioning effectively, through the process of peer review, not too much weight is given to the perspectives of any one individual, but instead, areas of both consensus and contention are explored and evaluated. Furthermore, having editorial boards, rather than one editor, sets up a culture that can make decisions through a process that can include debate, dispute, and argument. In the panels that review grant proposals, the process can be even more interactive, with reviewers discussing the merits of proposals together, and considering their ratings in the context of those of their peers. The people in “gatekeeper” positions have an influence on each other.

While the review process controls publication in journals, entry to conferences, and access to grants, “gatekeeper” is not a fully accurate metaphor in describing the process of peer review. The “peers” (reviewers) are not always of higher status or more central to the field than authors, as people serve in both roles. In addition, when submitting an article there is not just one specific center that everyone strives to enter. Academic communities are in one sense rigid and bounded, as in a physical location that can be accessed through a gate, yet in another sense are moving, developing, and evolving. At its best, the process of peer review can produce a dynamic field that fosters high-quality research, promotes scholars' development through the process of revision, and welcomes innovation. Peer review can foster movement in the field, as anyone piece of work is evaluated by colleagues with different backgrounds and vantage points. Editors can make the final decisions, examining the points of overlap as well as the areas under dispute.

Yet this description is an idealistic version of peer review. It does not take into account the ways in which power, privilege, and systemic inequalities mediate these processes. Reviewers and authors are not disembodied individuals but instead are shaped by various kinds of biases. As Eisenhart (2002) points out:

> Ideally, these reviewers will not have any known prejudices against the author or his/her work and thus will be able to judge it fairly, that is, on its merits. But in academic circles, scholars in the same field often do know each other personally and should know each other's work. They are likely to have some predispositions for or against the work. They are likely to have a vested interest in the success or failure of the work: They may be pursuing the same line of work or be the author's competitors. This creates a situation in which impartiality is easily compromised. (p. 248)

In addition to the biases that people hold regarding institutional prestige or the types of research, there are forms of biases in the peer-review process that emerge based on identity characteristics, such as race, ethnicity, socioeconomic status, and/or gender. For example, Bancroft et al. (2022) describe the implicit gender and racial biases that can impact reviewers' evaluations, and Nkrumah and Mutegi (2022) discuss the ways in which pressures towards assimilation pose obstacles to submissions by culturally and linguistically diverse authors. In addition, the peer-review process may tend to favor the forms of research of more established scholars, which may lead to the exclusion of emerging scholars (Eisenhart, 2002). When the established scholars, and therefore the gatekeepers, are mostly White, and review boards are not diversified, scholars with marginalized identities may not experience a fair review (Bancroft et al., 2022). Further, the efforts to increase equity within science education research, and within the education research field generally, can be negatively impacted if the approaches of scholars who explore equity issues are not welcomed, understood, and/or valued by some journals and/or reviewers.

The presence of biases in peer review can have profound effects both on individuals who are excluded, as well as on the innovation, and expansion of an academic field. One issue is that ongoing high-stakes evaluation of one's work by peers within academic careers can be emotionally exhausting in ways that exacerbate inequities. Academics often struggle with a sense of belonging, with "impostor syndrome" being well-documented (e.g., Hermann, 2016). These identity-related struggles are not evenly distributed, with negative experiences more likely to have an impact on scholars with marginalized identities (Bancroft et al., 2022). Racial inequalities that shape the experiences of faculty of color within higher education settings can increase this sense of impostor syndrome (e.g., Dancy & Jean-Marie, 2014).

In considering how to better center equity in reviewing, it is important to acknowledge that equity encompasses a variety of goals related to education (e.g., Bianchini, 2017). There is no one agreed-upon "standard" of equity, as there is a lack of consensus on what it entails (e.g., Gutiérrez, 2012). There are equity definitions used by organizations aimed at social change, such as this one that Kania et al. (2021) use from Urban Strategies Council: "*Equity is fairness and justice achieved through systematically assessing disparities in opportunities, outcomes, and representation and redressing disparities through targeted actions.*" Definitions similar to this one can apply to considering peer review in science education research. One approach would be to critically examine the processes of peer review for the presence of disparities, then take targeted action to redress them.

There are also conceptions of equity that are connected to particular school structures and instructional practices, including applying ideas related to fairness and justice to educational settings. These conceptions can entail the ongoing development of ideas, different emphases, and sometimes contested meanings. For example, the National Research Council (2012) describes the importance of equitable opportunities for all students to learn and holding high expectations for achievement. Calabrese Barton and Tan (2020) discuss the limitation of an inclusion focus and recommend a vision of "rightful presence," connecting students' political struggles within local contexts. Rodriguez and Morrison (2019) describe a "sociotransformative approach" tied to social change and education rooted in the experiences of historically marginalized youth. Mensah (2013, p. 66) describes the importance of "beliefs that each child has a right to learn science, should be given free access to science, is empowered by knowing science, and can benefit from opportunities to advance themselves educationally within science." These are only a few of the approaches that may be considered equity-focused by science educators. While many are compatible with each other, the emphases differ.

In addition, the term "equity" can sometimes be used as a signifier or a claim without much substance behind it. As Marshall and Salter (2022) point out in this series of essays, equity can sometimes be written into a proposal without much depth, in ways that they refer to as "boilerplate language". At such times, the term equity is an "add on" or a discursive move toward a claim to legitimacy, rather than fully integrated into the proposal. A question that emerges is what does it mean to "center equity" in the current climate where equity is often referenced, yet with considerable variation in both the specific meaning and in the depth of engagement?

The series of essays in this section take on different aspects of centering equity in reviewing science education research, raising vital issues, providing recommendations for advancing the field, and generating questions for further thought and investigation. Marshall and Salter (2022) conduct a series of interviews with science, technology, engineering, and mathematics (STEM) equity scholars and explore the need for equity as a lens when reviewing grant proposals. They provide recommendations for adopting equity-focused rubrics, supporting marginalized grant writers, and ensuring that funded proposals are tied to the needs, interests, and ideas of the communities involved. Bancroft et al. (2022) focus on biases in the process of journal review, investigating the presence of unbalanced review boards in which minoritized groups lack representation, considering the training that journals provide regarding biases, and providing recommendations for approaches to reviewing manuscripts that increase equity and fairness. Nkrumah and Mutegi (2022) point out the specific lack of investigation of disparities in the peer-review process based on race and highlight the need for corrective justice for people of African descent. In their study, they consider the reviewing practices of science education journals using McNair et al.'s (2020) framework regarding obstacles to organizations' endeavors towards racial equity. In addition, the three essays illuminate the ways in which biases in reviewing processes can disadvantage equity-focused scholars.

In this essay, I explore some of the insights provided in the manuscripts, consider various aspects of their arguments, and discuss questions that were raised for me. Rather than a traditional format with "questions for further research" in an implications section at the end of the manuscript, I embed them throughout. I view these questions, and the process of exploring equity in peer review, as an invitation for future papers, discussions, and dialog.

1.1 | Positionality statement

I am a qualitative researcher and associate professor at a Jesuit university in Philadelphia. I bring to this project a variety of experiences in both the author and reviewer roles for science education research journals, general education research journals, and National Science Foundation grants. In addition, I am an editorial board member for *Science Education.*

My research interests have included the relationship between identity and learning, social and emotional engagement in science classrooms, STEM teacher retention in high-need schools, the experiences of STEM majors from minoritized backgrounds, and collaborations between science and math faculty members and K-12 teachers. My own work has been published in journals that include *Science Education*, *Journal of Research in Science Teaching*, *Research in Science Education*, *Cultural Studies of Science Education*, *Urban Education*, and *Education and Urban Society*.

As a White female cisgender researcher working with minoritized groups in many research settings, I have needed to engage in ongoing reflection on the way my own positionality can impact the design of questions, data collection and analysis, and reporting, with implications for fairness and ethics. I have written several papers specifically about the impact of power differentials between researcher and researched. I strive to take a reflexive approach, considering how my own background shapes my perceptions and interpretations, evaluating my written work for evidence of potential biases, and seeking perspectives that lead to growth. I have a strong interest in considering the ways in which biases and inequities emerge in research processes, including within peer review.

I am appreciative of the opportunity to be a part of the Science Education Campaign for Research, Equity, and Teaching project, of my colleagues' expertise, and of the sharing of ideas, experiences, analyses, and recommendations in the collective exploration of centering equity in science education research.

1.2 | Frameworks in considering the role of peer review

1.2.1 | Nested systems

While this series of essays explores the pursuit of equity specifically as it pertains to peer review, this endeavor is connected to the complex process of working towards equity within education systems generally, which entails various types of tensions. For example, Cochran-Smith et al. (2016) describe a tension in that teachers need to work from the assumption that they play an important role in influencing the life chances of students marginalized in schools, yet at the same time they also need to recognize that equity within the broader society cannot be achieved only through good teaching. In any field, striving towards equity will have some limitations, as systems interrelate and are nested within larger systems.

Bancroft et al. (2022) describe, “Inequity refers to unequal outcomes between different groups despite evidence of equal intellectual merit.” In peer review, as in other processes, inequities can emerge both from aspects of a particular interaction, and because such events are nested within larger social inequalities. In terms of the peer review events themselves, unfair reviews can occur due to identifiable biases held by individual reviewers. For example, Bancroft et al. (2022) discuss the ways in which reviews are impacted by race, gender, and geographical biases.

In addition to the direct biases, there are also aspects of systems connected to reviewing that can lead to further disparities. For example, Nkrumah and Mutegi (2022) discuss the way in which journals' statements regarding publishing manuscripts “of interest to our readers” and required writing styles that push cultural assimilation end up excluding non-White scholars. They describe the ways in which journals, like other organizations, tend to ignore the racialized consequences of these actions. As another example, Marshall and Salter (2022) describe the biases that occur when reviewers may give a pass to someone that they already know, assuming that the author has sound arguments without necessarily examining them thoroughly. When panels do not have sufficient diverse representation, such processes result in inequities. Overall, the biases that can occur within peer-review events are nested within broader societal inequalities that impact outcomes in a variety of ways. Disparities can emerge from rules and norms of peer review that on the surface seem “neutral,” yet in actuality uphold racist systems and do not end up as neutral in their implementation and effects.

Another issue that Marshall and Salter's (2022) essay raises is that focusing on reducing the biases of a reviewer is not going to address the main problem if scholars of color have not been given adequate opportunities before the point of submission. They discuss that there are institutional resources that not everyone can access and unspoken norms that not everyone knows due to disparities in access to mentoring specifically for grant proposals. They write, “The issue of centering equity is a larger, more systemic issue. Similarly, our experts believe issues of equity must be addressed before the review panel is constructed. Kinnis, one of their study participants, stated, “I don't think that panels are the arena to fight for equity…. ‘If the issue is HBCUs don't get enough federal funding, I don't think changing the reviewer's thoughts is the solution.'" An implication of this point is that even if the reviewer is fair in evaluating the submitted proposals, the outcome would not necessarily be fully equitable, as inequalities had shaped opportunities before the time of review.

Furthermore, systemic inequities have implications for the outcome of any type of interactional event that involves ranking and sorting. During the peer-review process, manuscripts and proposals are rated and compared to each other, and the submitters have to interpret the results and develop their professional identities within this context. These experiences in the context of racism, sexism, and other forms of discrimination within the broader society can result in negative peer reviews having a larger impact on scholars with marginalized identities (Bancroft et al., 2022).

In addition, science education peer review is integrally connected to contexts such as schools, communities, and out-of-school educational settings. Therefore, the goal of centering equity in reviewing needs to be seen as interrelated with efforts to center equity in science education more generally. For example, even if a review for a manuscript is fair and unbiased, inequities could be perpetuated if the research processes themselves are not conducted ethically and collaboratively with communities. Marshall and Salter's (2022) essay explores the ways in which the grant review processes could better center equity in the science education field overall, such as by examining whether funded research is conducted in partnership with communities, whether the researchers are connected to the settings for research, and whether there is a substantial exploration of equity within the proposal. By considering equitable collaborations and connections with communities in evaluating proposals, the peer-review process for grants can support equity within the science education field generally.

1.2.3 | Communities of practice and professional identity

In some ways, an academic field, or subfield, can be considered a "community of practice" (Lave & Wenger, 1991) which entails joint enterprise, shared activities, and negotiation of meaning. When functioning effectively, there is mentorship and collaboration as more central participants enculturate peripheral participants into the ideas, practices, standards, and norms. Yet communities of practice vary in terms of the clarity of what constitutes the "center," or whether there is relative agreement on ideas and norms. Some types of professional communities, such as education research, may have a less clear "center" and "periphery" than others, with disputes regarding where the field should move or what types of methods and topics should be prioritized (e.g., Howe & Eisenhart, 1990; Libarkin & Kurdziel, 2002). Researchers may also have different experts that they follow, and forms of argument they value more than others. Education research manuscripts themselves are sometimes positioned in dialog with each other regarding theory, interpretation, and goals. One relatively new science education journal, *Cultural Studies of Science Education*, directly acknowledges the importance of these types of interactions through the structure of forums which invite commentary and interaction between authors (Roth & Tobin, 2006).

For a community of practice to thrive, the peripheral participants need to be active contributors, accepted as members, and be able to influence the collective activity. Often this process would involve social interaction between participants, and new members would need to be able to trust in effective guidance and mentorship. The peer-review process, when functioning well, can be viewed as one of many facets of this enculturation, during which authors learn the norms of the field, gain experience with the publication process, and may become reviewers themselves. Sometimes advisors and mentors specifically focus on preparing graduate students to respond to reviews as they revise their work. If reviewers are respectful of authors, and critically evaluate and engage with diverse perspectives, the peer-review process could potentially aid in academic fields being dynamic and interactive.

Lave and Wenger (1991) describe the ways in which identities are forged within communities of practice, as peripheral participants develop a sense of membership that promotes increased participation. Similarly, Carlone and

Johnson (2007) describe the importance of "recognition" within a relevant community for identity development. The outcomes of peer review, therefore, have implications for scholars' professional identities.

Identity verification and recognition can occur within any setting, however, within competitive, hierarchical fields where there are very few positions relative to people striving for them, this process is particularly impactful. In the context of a society where racial microaggressions pervade workplaces, including higher education (e.g., Lee et al., 2020; Miles et al., 2020), the impact of unhelpful reviews that contain unprofessional and personally attacking statements can have disproportionate impacts depending on a scholar's positional identity and prior experiences of marginalization within academic settings (Bancroft et al., 2022). Problematic reviews are nested within a larger social context of racial inequality and pervasive microaggressions within the larger society. For example, studies have shown that many Black faculty members have had to contend with racism in their tenure cases, microaggressions, biased evaluations, and hostile environments (Atwater et al., 2013; Witherspoon et al., 2016). Black women scholars in particular experience challenges due to contending with racism and sexism in academic settings (Love et al., 2021).

Given the importance of recruiting and retaining scholars from minoritized backgrounds in science education and in other academic fields, it is vital to examine the ways in which aspects of the peer-review process may exacerbate inequities in the enculturation of members of these groups into what should be dynamic, changing, and welcoming academic community, and plan for positive change.

1.3 | Centering equity in reviewing: Insights from the essays

1.3.1 | Considering researcher and reviewer identities: Equity through representation

Peer reviewing is subject to issues with any system designed to judge "merit," in that the rules, norms, and processes can be justified by claims to objectivity, yet this claim can mask both internal biases and the biases that emerge due to nested systems. As Nkrumah and Mutegi (2022) point out, racial inequities can be perpetuated by a variety of processes, including the tendency of journals to reproduce the status quo and operate under the "myth of universalism." In addition, they point out the challenges that non-White scholars face in getting published due to the obstacles that McNair et al. (2020) describe, including claiming not to see race and evasive responses to racial incidents.

Having multiple reviewers rather than just one reviewer is supposed to somewhat address potential biases, leading to a more trustworthy process by providing varied perspectives. Yet without adequate representation from scholars from diverse backgrounds and perspectives on review boards, multiple reviewers for one manuscript would not necessarily lead to a fair review. As another approach, Nkrumah and Mutegi (2022) discuss that bias can be reduced by assigning reviewers to authors based on characteristics including racial identity and orientation to equity-focused work. Still, representation on review boards would need to be improved to even make it possible to match reviewers and authors on identity characteristics.

The essays in this collection explore increasing the representation of scholars from minoritized backgrounds on panels and journal review boards, as this approach could contribute to a more effective review process for manuscripts and proposals that center on equity. In their study, Bancroft et al. (2022) explore the importance of representation on panels and review boards as a way to lead to fairer evaluations. They investigate the composition of review boards with regard to marginalized identity, exploring the need to be more inclusive of scholars who are Black, Indigenous, and People of Color. Marshall and Salter's (2022) essay emphasizes the importance of diverse representation to fairly and effectively evaluate proposals, ensure that scholars from minoritized backgrounds are not isolated on review panels, and provide relevant feedback for applicants from racially marginalized groups and/or who engage in equity-focused research. They discuss the importance of having multiple reviewers with experience that would enable them to evaluate proposals with regard to equity, as dialog and varied perspectives are needed to provide an effective review. They write, “If equity-minded people were able to review on a panel together, there would be a depth to conversations on equity that are not always had.” Adequate representation would lead to a more enriching discussion on panels and enable equity to be evaluated as part of a dynamic process.

Another important aspect of representation that Marshall and Salter's (2022) essay explores is reconsidering who should count as a “peer” in reviewing grant proposals. An implication is that broadening participation may entail reconceptualizing the composition of a reviewer panel to include not only scholars in the field but also practitioners and/or community members who can evaluate the impact of the proposal on the people involved. Such an expansion would lead to other questions regarding how to recruit for these boards, and how to consider expertise for particular questions, such as the impact of a proposal on the community. They argue for the importance of including community partners in evaluating proposals.

Marshall and Salter (2022) describe the ways in which adequate representation would facilitate a process that supports the development of proposals that take risks and explore equity in a more in-depth way, rather than just proposals that include “boilerplate” statements. An implication is that equity-centered reviewing means that including “equity” in a proposal should not just be a statement or afterthought, but instead is investigative and innovative. Centering equity is part of the development of the science education research field and needs to be evaluated based on merit, including taking risks and innovating with regard to equity.

One question to contend with over the long term is how will a particular science education journal know when representation is attained. Is a positive outcome measurable by numbers, or is it more measured by the experience of scholars, in the sense that regardless of background, scholars experience the process as fair? Or is there another criterion by which people can consider adequate representation? While as a field we are not there yet, and this question is for the future, it may be important to keep a goal, or goals, in mind as journals and funding organizations engage in the ongoing evaluation of their own processes.

1.3.2 | Considering peer-review processes that better support equity-focused research

Equity in peer-reviewing within science education research is not only about the fairness of the review process itself. Another issue is considering how to effectively review equity-focused research and the role of reviewing in advancing overall efforts towards equity in the field of science education.

There are various facets raised in the essays that relate to equity as a quality that needs to be specifically evaluated in the process of review. For example, Marshall and Salter's essay raises the issue of proposals that might claim to support equity, yet on a closer look may not be that equitable. Marshall and Salter's interviews also suggest the importance of proposals that take risks in considering equity. Their interview with Malcolm Butler includes, “I mean, don't just do the normal, take some risks with this work, because that's what we really need. If we're going to diversify the teacher workforce, we've tried all these things they are listing and look where we are.” An implication is that equity-centered reviewing means ensuring that research that claims to focus on equity is investigative and innovative rather than prescribed. Just as a strong manuscript or proposal aims to develop theory and/or address a gap in the literature, a strong manuscript or proposal that claims to focus on equity needs to be evaluated based on potential innovation in the area of equity in science education.

Another area for evaluation with regard to equity is the need for involving communities in research. Marshall and Salter quote Bhaskar Upadhyay in their discussion of the importance of reviewers asking the question, “is the research conducted in an equitable way.” They describe the need for reviewers who can move beyond surface statements, and who can assess the researcher's involvement with the community. In addition, they discuss the importance of rejecting context-free research. Similarly, Nkrumah and Mutegi (2022) describe that to move towards equity, reviewing should include checking for the use of euphemistic terms for groups when discussing inequalities. Rather, groups discussed in a manuscript or proposal should be specifically named. In my interpretation of these types of recommendations, just as studies with insufficient descriptions of methods would be rejected and/or required to resubmit, insufficiencies in addressing context would be treated in a similar way.

The recommendations from these essays have implications for the need to rethink the relationship between “equity” and “merit” (or quality). They effectively convey the ways in which equity can inform standards, with equity as an essential component of quality. High-quality research in science education would benefit the community involved, in addition to other criteria such as having a strong theoretical grounding. Grant proposals could be evaluated on aspects such as whether the collaboration between the researchers and community members is equitable, and whether the study itself contributes to equitable outcomes within the field of science education. One recommendation raised in the essays would be to design training and/or preparation for reviewers that go beyond statements and checklists to an integrated process. Marshall and Salter point to guidelines for reviewing grant proposals regarding equitable relationships between researchers and the communities in which they work and suggest the implementation of rubrics related to equity as a means of ensuring a more thorough consideration of the implications of any proposal. They recommend, “Adopt equity-focused rubrics and models. The standard grant proposal rubric used to assess scientific merit may be enhanced by equity-centered review criteria and questions that address community involvement/benefit, sociocultural and historical underpinnings of STEM— specifically.” Similarly, Bancroft et al. (2022) recommend training for reviewers that directly addresses implicit biases.

An overall implication is that funding organizations and journals could take the position that while not all research has an understanding of equity as the main focus, no studies should perpetuate inequities in their design and implementation. In some ways, this issue relates to the importance of research ethics. As a reviewer, one area that I consider is how the author addresses the power relationships between researcher and researched. This can be particularly problematic when the researcher is from a dominant group, and the researcher is from a marginalized group. Just as a reviewer would attend to issues of ethics as an aspect of quality research, reviewers can also be prepared to similarly consider equity.

In considering equity as one aspect of quality, the specific considerations for any given journal or funding organization could be dynamic rather than rigid. It would be important, in my view, for such criteria to be inclusive of various forms of research, including qualitative, quantitative, mixed-methods, and theoretical papers. Like any measure of quality, it would be subject to the interpretation of the reviewer – just as reviewers may disagree on the adequacy of the theoretical frames or the appropriateness of the method, they may also disagree on equity. However, the process of reviewers evaluating equity in manuscripts and proposals, and at times disagreeing with each other, would advance understanding and develop theory in this area.

Centering equity in reviewing would, therefore, have to address the ways in which equity in education has many components. People may not necessarily agree on a definition of equity, on what types of research would be considered equitable, or on priorities for equity in science education. One question to consider is how would a journal or funding organization prepare reviewers to evaluate work, especially since there are different views of what is considered equitable? Marshall and Salter address this issue by recommending specific rubrics, such as the community-based participatory research model.

However, even if rubrics are adopted and support the evaluation of areas such as community engagement, not all aspects of equity may be assessed using a rubric. Considering equity in education is ongoing, with meanings and goals contested and developing. For example, some researchers would argue that a proposal can be considered sufficiently equitable if the project would lead to increased access from underserved groups of students to a particular aspect of STEM education that the students and community value and want to access. However, others might argue that increasing access is not necessarily equitable, as it does not adequately interrogate power relations between participants or question the field of science. In preparing reviewers to consider equity, it seems that it would need to be done in such a way that fosters space and dialog regarding different conceptions of the types of work that some might consider equitable. This dialog in turn could help develop the field; if reviewers at times disagree with each other, and refine their ideas and arguments, this may also be another way of centering equity.

These differences can be a strength if the goal is centering equity, as centering equity entails equity as a focus. It would involve direct engagement and risk-taking, rather than the canned statements that Marshall and Salter describe as sometimes appearing in proposals. One question raised for me: How can training be designed that are inclusive of various perspectives, and that center on equity in ways that allow for discussion, debate, and development of the field?

1.3.3 | Considering unprofessional reviews in the context of societal inequalities

Not all reviewer comments are productive in helping scholars develop their research agenda and/or revise, and some comments by reviewers may be insulting, aggressive, and/or border on personal attacks. While most reviews may focus on improving the author's content, the norms and rules surrounding peer review still allow comments that are both unproductive and hostile. The norm is for editors to provide the authors with the full reviews that they received. Bancroft et al. (2022) describe experiences of hostile comments, some of which have had direct racial implications, such as critiques that a manuscript was "being 'preachy' about race." They cite Silbiger and Stubler (2019) in their discussion of the ways in which reviews that are unprofessional or contain personal attacks have a disproportionately negative impact on people of color, women, and nonbinary people. They describe, "White men were the group most likely to report unprofessional reviews having no impact on their self-perceived scientific aptitude and their career advancement."

The finding of disparate outcomes for hostile reviews based on race coheres with theories on the process of identity development within communities of practice. Hostile comments will impact a person's perception of recognition by the professional community (Carlone & Johnson, 2007) and will have a proportional impact depending on the extent of the threat to professional identity (Stryker, 1968). Within any field, if one's own identity-related group (or groups) are in the majority, there is more likely to be a sense of being entitled to be there. In the science education field, an established researcher from a dominant background has the privilege of perhaps disputing reviews, or at the very least ignoring them. However, an early career researcher who is from a marginalized identity may experience profound impacts from such a review, as this power differential between "peers" is nested within overall racial inequality in the U.S. The impact of identity threats through reviews could be compounded by experiences of marginalization, isolation, microaggressions, stereotyping, and negative stereotype threat (e.g., Miles et al., 2020). Such experiences can lead to scholars who have marginalized identities questioning their place in the field. These experiences could also end up undermining an equity-focused research agenda if scholars feel pressured to pursue an area that they anticipate would enable them to avoid those types of comments.

The prevalence of inequities that shape the context of peer-review poses obstructions to effectively welcoming new members as participants. One issue is that if experiences with peer review are inappropriately negative and unwelcoming, emerging researchers may experience identity threats (e.g., Stryker, 1968) and/or abandon work with strong potential. This process, in turn, can stifle innovation, change, and movement in the field. The norms of the peer-review process may make it particularly susceptible to negativity due to the combination of the power in the "gatekeeper" role of a reviewer, the interactional distance between reviewer and reviewee, the lack of accountability of the reviewer, and norms that permit attacks that border on personal. As Bancroft et al. (2022) point out, reviewers may have gender, racial, and/or other forms of biases, and favor studies similar to their own, which can increase the likelihood of scholars from minoritized backgrounds receiving such reviews, thereby disadvantaging them in the field.

For reviewing to be more equitable, scholars of color should be able to expect their work to be evaluated fairly, without bias. The process should also not be unequally demoralizing. Rather, a fair review requires a direct, straightforward, and critical assessment of the work, without personal attacks, biased comments, and inappropriately questioning credentials. In the context of societal inequalities, such comments end up as microassaults. Nkrumah and Mutegi (2022) discuss the problems of "evasive reactions to racist incidents" in peer-review processes, which can occur when journals ignore when the word choice of reviewers reflects systemic racist ideologies.

The disparity in the impact of unprofessional reviews based on identity is unethical because of its contribution to racial inequality. However, it could be argued that the norms that allow such reviews are unethical for other reasons as well. In some ways, these reviews undermine the goals of the scientific enterprise. Personal attacks contradict with goals of knowledge building, collaborative engagement, and fostering high-quality research. With norms that allow rude reviews, under the guise of "reviewing," a reviewer may just be advocating for their own approach to research and/or theory, attempting to undermine competition, discredit alternate ideas, or receive some type of status boost at the expense of another researcher.

In addition, journals and funding organizations are aspects of communities of practice in which new members become enculturated into the norms of the profession. By setting up structures in which these types of comments are commonplace and expected, then that is the culture that we, the science education research field, are creating for new members. Even under a hypothetical situation in which there were no identity-related biases impacting a review, these rude, unprofessional comments may still be unethical as they alienate new members and run counter to the goals of the field. As occurs sometimes in other areas of the social world, when practice is inequitable in its outcomes, this may be indicative of other ethical and practical problems with that practice.

I can imagine that some would read this section and think, "But we need the harsh critiques, as it is important to provide direct feedback." I think it is important to separate "harsh critique" from "rude, unprofessional comments" as they are not equivalent, or not necessarily even connected. Anecdotally, in the few times when I have received unprofessional comments, the rest of the review was not particularly helpful either, as the reviewer did not fully engage with the work. If anything, striving to reduce the practice of attacking reviews might improve the critical aspect of reviews, enabling a more honest assessment intended to make them work better. What would change is the presence of biased and rude comments that do not add anything to the substance of the review and convey barriers that are likely to have a disproportionately negative impact on scholars with marginalized identities.

Bancroft et al. (2022) recommend some potential changes: "We encourage editors and journals to seek ways to evaluate the quality of reviewer comments and remove personal, rude, and biased comments from reviews. It is also important for editors to engage with these reviewers on the unprofessional nature of the comments and how to proceed more professionally moving forward." I appreciate these clear recommendations for journals to remove such comments, and I agree with the idea that reviewers need to be brought into the process. These can be important steps in changing the norms and outcomes.

In considering how unprofessional and hostile comments could be eliminated, there may be some complications in the details regarding how editors should respond to such comments. I am not sure how to address these issues and questions that I raise, but I think they are important to consider. One issue is that it may be hard for editors to determine which types of comments should be eliminated. Some reviewers, for example, write in a sarcastic style that is not targeted at an individual, and should not necessarily be changed, as it is just part of the communicative variation. It may be difficult for editors to have to sift through the intent and the potential outcomes. However, perhaps there could be some norms that are generally agreed upon for addressing overly egregious comments. Should this practice be limited to the most extreme types of comments? How should it be determined? Would it have to be several editors who screen, as one person's judgment may not suffice to distinguish between rude comments and harsh tone?

Further, if an otherwise thorough review contains a statement that borders on insulting, should that comment be eliminated without telling the reviewer or the author? Should it be sent back to the reviewer? I have discussed this issue with others, and a peer raised this point: There could be situations in which a negative review with a hostile comment removed may be worse for an author since at least that comment is a signifier that the reviewer has some kind of bias that contextualizes the negativity. With just that comment removed, the author may not be aware of the bias, and therefore be even more impacted by the negative review. How will an editor know if it is better to leave the comment in, take it out, or not send the review at all? Are there some types of comments that should have an acknowledgment by the editors to the author, such as "we recognize aspects of this review are—" rather than removal? Are there some types of reviews that should not be sent at all, and if so, how to address this with the reviewer, who is a volunteer and put the time in? Should reviewers be informed that a comment was deleted? Should the review be sent back to them, with feedback from the editor?

Of course, it is better to avoid these types of problems in the first place. Bancroft et al. (2022) suggest several other recommendations that could be applied to foster more productive reviews. They recommend diversity in review boards, triple blinding the process of peer review, including peer review as part of training in doctoral programs, and antibias training from the journals themselves. Through these strategies, reviewers would reflect on their own reactions to a particular piece of research, and distinguish between their own particular biases based on their subfield and position, and the quality of the work itself. Nkrumah and Mutegi (2022), drawing on their participants' comments, offer some recommendations for reconceptualizing the peer-review process for journals "as serving as a conduit for moving papers with strong potential to the canon of published work, rather than serving as a gatekeeping function aimed at keeping work out."

However, training may not fully address the issue, as making these types of comments in reviews has long been a part of accepted practice. Considering "rude reviews" raises the issue of whether aspects of the culture of peer review are due for a change. My impression is that it has been long assumed that hostile reviews are just something scholars should expect, and mentors in graduate school sometimes prepare their students to respond to them. An underlying assumption is that unprofessional reviews are just going to happen sometimes in any situation where critical feedback is solicited, however, I think that is a faulty assumption. Rude reviews do not improve quality; they hide behind the ideology of "improving quality," but actually are irrelevant, unproductive, perpetuate racial and gender inequalities, and interfere with the functioning of the science education research field as a community of practice. I do not have answers, only the question… Is there a way to modify those norms, leading to a stronger critical, productive process of review that fosters innovation, inclusivity, equity, and excellence?

1.4 | Considering reducing identity-related biases through "blinding"

In some types of situations, not knowing anything about the identity of someone is helpful in a ranking or evaluation process. For example, studies show that violin auditions from behind a wall, where the evaluators cannot see the musicians, will lead to less biases in the results (Goldin & Rouse, 2000). However, there are complexities in striving for anonymity or assuming anonymity, in evaluating education research. There are tensions regarding reducing bias by reviewers having no knowledge of the researcher (blinding), and the idea that some aspects of researcher identity may be beneficial to disclose as they are assets to conducting the research.

As one example, scholars who have racially marginalized identities and who are doing equity work may experience conflict regarding whether to disclose in a positionality statement. By disclosing their identities, their anonymity is compromised and they may encounter obstacles due to reviewer racial biases. However, their identities may be relevant to the research and maybe a strength in their qualifications to do the work. A researcher familiar with the community may wish to disclose this connection.

I have spoken with several researchers who describe experiences of being welcomed to disclose, and this clear guidance was helpful in outlining the orientation of the organization and its openness to their work. In addition, Bancroft et al. (2022) recommend that journals provide clear diversity, equity, and inclusion (DEI) statements that can communicate the journal's stance. In these cases, the positionality statement would be welcomed, however, at the same time, the organization would need to attend to the possibility of biases.

Another area that Bancroft et al. (2022) consider is the biases that may come from editors in addition to those from reviewers. They explore the benefits of a "triple blinded" process in which the identities of the authors and reviewers are blinded to the editor. Yet they also raise the issue that research can sometimes not be completely "blinded," as sometimes the identities of authors can be recognized by their content.

In addition, if editors do not know the identities of authors and reviewers, it may be difficult for them to assign manuscripts to reviewers who are familiar with the research area, or whose identity characteristics are a match with the author. As Nkrumah and Mutegi (2022) discuss, it might be more equitable for an editor to assign a proposal to a reviewer from a similar racial identity and/or a similar research approach, and therefore may be in a position to more effectively critique the manuscript. Triple blinding that also enables some editorial control over matching could possibly be accomplished by an editorial team, in which the editor who makes the decision regarding publication is not the same person as the one that assigns reviewers to manuscripts.

Some aspects of the norms of reviewing stem from an assumption that people can be objective. However, as Nkrumah and Mutegi (2022) point out, the assumption of universalism neglects the racial realities that shape experiences. We know that 1) people can be biased towards or against a variety of characteristics; 2) Not knowing the characteristics of authors may also lead to its own biases, by deeming irrelevant the researcher's identity which may be an asset to the work; and 3) sometimes aspects of the identity of a researcher is apparent regardless of efforts towards anonymity. People can still tell what type of work it is, and even if they did not know the researcher, it is possible to guess.

In considering how to address issues of identity, anonymity, and bias, I am left with questions: Can these biases ever be eliminated or reduced, if complete "blinding" is near impossible, or at least, not always desirable? Or is it better to just acknowledge that biases exist, and work the system around them, for example, a combination of some of the recommendations such as selecting reviewers based on matching, conducting training, and working to change the norms regarding unprofessional statements? The goal then would not be to eliminate all biases, but instead, have a process that reduces its potency. Does this mean that as a field we are dependent on either professional judgment or editorial intervention? Is there a way to devise a system that can avoid and/or compensate for identity-related biases?

1.4.1 | Considering the equitable distribution of resources

The peer-review process can be seen as discriminatory if outcomes end up perpetuating existing racial inequalities. As Marshall and Salter's essay points out, if the funding, mentoring, and preparation for developing grant proposals have been unequally distributed, the outcomes of any particular review for a grant proposal cannot be fair. Inequalities need to be addressed before that stage.

Nkrumah and Mutegi (2022) describe the importance of compensatory actions in response to historical racial inequities, including the educational debt owed to people of African descent in the U.S. They describe that ignoring racial inequity has allowed for its persistence, and they discuss the need for "identifying mechanisms by which racism is enacted through those structures, policies, and practices." An implication is that identifying and rooting out the sources of inequities should become part of the ongoing practices of funding organizations and journals.

Among other possibilities, the essays in this section explore actions that include resources, support, and engagement of journals and funding agencies with DEI goals. As one example, Marshall and Salter's (2022) essay explores how racially marginalized grant writers would benefit from the support of other researchers who have navigated the systems. In addition, they describe that mentoring and other types of support need to be implemented by universities. They discuss the perspectives of Kinnis, "He suggested 'mock panels' during the summer so that people have some experience and also have some insights into the process, which would promote their participation."

Nkrumah and Mutegi (2022) explore the ways in which journals can counter racism through more direct guidance: "As part of this process the journal could identify implicit rules and norms and provide guidance to authors making these rules and norms explicit." Other recommendations include actively working to counter the norms that may discourage people from pursuing equity-focused research. Marshall and Salter recommend that funders prioritize equity-focused research, and make it clear that such proposals are welcome. Bancroft et al. (2022) discuss the importance of diversity statements by the journals, and emphasis on antibias in reviewer training.

2 | CONCLUSION

Endeavors towards increasing equity in peer-reviewing are complex, entailing consideration of nested and interrelated systems. Avoiding biases in the process of peer review is vital to a more equitable science education research field, yet being "unbiased" is not enough to ensure equitable review in the context of entrenched inequities within the broader society. Instead, reviewers and organizations can take an antiracist stance, in the sense that processes that contribute to racial inequities and other types of inequities are identified, acknowledged, and directly opposed. My colleagues have explored various possibilities through their investigations and provided product recommendations. These include changing the rules and norms of peer review to be more equitable, ensuring that reviews are free from race, ethnicity, gender, and other kinds of identity-related biases, working towards equitable distribution of the resources (advising, mentoring, and valuable feedback) that support fair reviewing, and establishing criteria and rubrics that support research that is conducted in collaboration with communities marginalized in science education.

An issue for further consideration is the evolving relationship between "equity" and "merit" with regard to peer review. An implication of some of the points in these essays is that just as proposals and manuscripts need to have solid research methods and robust theoretical frameworks, studies should also develop knowledge in the field with regard to equity, address specific contexts in their research, and benefit communities. These and other aspects of equity could be considered as reviewers assess overall merit.

In planning for the next steps, journals and funding organizations may strive to be more equitable in their practices. In doing so, they might want to hold themselves accountable to specific goals, yet given the complexity of efforts to center equity, an end goal may not be agreed upon or even specified. Some additional questions that emerged for me include: In working towards equity, how do we assess progress? Do we measure equity by outcome or by the process? What would equitable representation on a review panel look like, given the multiple dimensions and viewpoints that could affect such a determination? If representation is expanded to practitioners and/or community members, what would that look like, and what processes would facilitate common ground?

Questions that prioritize outcomes may be difficult to address at this moment. "Equity" (or "centering equity") is not so easily measurable, and it is difficult to think of assessment approaches that would provide more than an approximation of some form of progress along a specified dimension of a very complex concept. The pursuit of equity is sometimes framed as the recognition and opposition to a current inequity, rather than as a state or end goal. Therefore, rather than considering a predetermined outcome, a journal could instead continually evaluate specific aspects, such as progress towards a more racially diverse review board, the implementation, and impact of antibias training, and evidence for welcoming equity-focused research, the provision of resources, mentoring and support for minoritized scholars. These organizations can also continually evaluate whether scholars experience fair, constructive reviews, whether the journal supports diversity in research approaches, methods, and frameworks, and whether their practices welcome studies that are conducted through community collaborations. These varied approaches all center on equity, contributing in meaningful and transformative ways.

Perhaps "centering equity" also entails the recognition that efforts towards equity in science education may benefit from more conceptual development, and from the discussion, action, and evaluation within journal review boards and granting organizations. These essays as a whole center on equity in their collaborative approach to the topic, meaningful engagement with scholars in the field who have diverse backgrounds and experiences, exploration of nuanced arguments that consider the complexity of nested systems, and the value placed on the impact of science education research within communities that have been marginalized in U.S. education. The ideas and recommendations for change that my colleagues have raised, in combination with each other, and as part of an ongoing, critical and reflective process between peers, center equity in their invitation to action, dialog, and movement.

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