FROM THEORY TO PRACTICE AND BACK

How the Concept of Implicit Bias Was Implemented in Academe, and What This Means for Gender Theories of Organizational Change

LAURA K. NELSON
KATHRIN ZIPPEL
Northeastern University, USA

Implicit bias is one of the most successful cases in recent memory of an academic concept being translated into practice. Its use in the National Science Foundation ADVANCE program—which seeks to promote gender equality in STEM (science, technology, engineering, mathematics) careers through institutional transformation—has raised fundamental questions about organizational change. How do advocates translate theories into practice? What makes some concepts more tractable than others? What happens to theories through this translation process? We explore these questions using the ADVANCE program as a case study. Using an inductive, theory-building approach and combination of computational and qualitative methods, we investigate how the concept of implicit bias was translated into practice through the ADVANCE program and identify five key features that made implicit bias useful as a change framework in the academic STEM setting. We find that the concept of implicit bias works programmatically because it is (1) demonstrable, (2) relatable, (3) versatile, (4) actionable, and (5) impartial. While enabling the

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concept's diffusion, these characteristics also limit its scope. We reflect on implications for gender theories of organizational change and for practitioners.

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Implicit bias is one of the most successful cases of an academic concept being translated into practice in recent memory and is widely used by advocates in the United States, Australia, and Europe to raise awareness about gender inequalities and make a case for organizational change (Jenkins 2018; Nielsen 2021). Project Implicit[1] was released in 1998 as an international collaboration (hosted by Harvard University), with the goal to educate the public about hidden biases. Since its release, more than 20 million people have taken the Implicit Association Test (IAT), exposing the public to theories about how explicit stereotypes shape attitudes. Broadly understood, implicit bias conveys how people can act based on prejudice and stereotypes about social groups without intending to do so. Industry leaders and practitioners capitalized on and bolstered the popularity of the concept, spurring a training industry devoted to raising awareness about implicit bias in order to promote equity in organizations. Implicit bias thus exemplifies how social scientific theory can influence discourse *and* practice on a large scale.

While the efficacy of the concept of implicit bias for feminist change is debated, the concept's extensive reach suggests that thousands, if not millions, are discussing feminist-minded transformation even where feminist ideas do not typically gain traction. Yet similar to other institutionalized concepts, such as diversity (Ahmed 2012) and inequality (McCall 2013), popular use of the concept tends to individualize inequality while leaving structural roots hidden. As implicit bias becomes a catch-all for explaining social inequality, it may prevent frameworks centered on power and oppression from taking hold (see also Wynn 2020). The individualization process may abdicate the responsibility of organizations to address structural inequalities, creating tensions for those advocating for systemic change. Understanding the popular success and limitations of this concept can offer important insights into broader theories of strategic change.

To understand implicit bias as a concept for gender organizational change, we explore its adoption in the National Science Foundation (NSF) ADVANCE program,[2] which seeks to increase the participation and advancement of women in academic science, technology, engineering, and mathematics (STEM) careers. Treating the NSF ADVANCE program

as a case study, our research asks when, how, and why implicit bias became a popular concept in the ADVANCE network and identifies features that enabled its diffusion and application.

Through an analysis of ADVANCE documents, interviews, and field observations, we identified five features that made implicit bias a successful and powerful but also problematic concept in the ADVANCE program. Implicit bias is

1. demonstrable: can be verified with positivist, causal, and experimental methods;
2. relatable: involves individuals having experiential knowledge of their own and others' biases;
3. versatile: is applicable to a range of situations, settings, and organizations;
4. actionable: can be addressed with clear, immediate action and specific initiatives and programs; and
5. impartial: depoliticizes discussions of gender inequalities by avoiding perceptions of gender, privilege, and power, thereby making the concept more palatable to audiences that may initially resist such interventions.

Our research builds on scholarship of other academic concepts that have achieved large-scale application, including diversity (Ahmed 2012), comparable worth (Acker 1989), and inequality (McCall 2013). Such concepts have an intellectual history, but also a practical history of operationalization and application toward addressing inequality through organizational practices. Both diversity and comparable worth—like implicit bias—were not intended to be neutral descriptors of a singular situation but as a way to formulate a problem related to inequality in solvable terms. The "practice-oriented" approach primed actors toward specific ways of linking problems and solutions that do not always work as intended. Likewise, the five features of implicit bias are not "neutral," as they too hold potential to undermine institutional change. By identifying key junctures where theory enables or constrains social change, we further the development of gender theories of organizational change.

THEORIZING CHANGE

Institutional Change

Universities, particularly STEM fields within universities, are deeply gendered and racialized organizations (Acker 2006; Alegria 2019; Bird

2011; Britton 2017; Fox 2008; Miller and Roksa 2020; Rhoton 2011). With decreased public spending, "academic capitalism" has increased competitive pressure on faculty productivity in terms of publications and grants, expanded the power of administrations over faculty governance, and led to other institutional changes that affect how advocates promote gender equity in the academy (Ferree and Zippel 2015). In this context, ADVANCE aims to enact *systematic change* to promote recruitment, hiring, retention, and promotion of women faculty in academic STEM careers. It does so by funding change projects typically led by teams of STEM faculty and top-level administrators in colleges and universities.

Starting with the 2009 solicitation, ADVANCE grant recipients were, and continue to be, asked to ground proposals for institutional change in social scientific theory. Grantees, as part of knowledge-producing organizations, were charged with contributing to fundamental knowledge about gender, science, organizations, and change (Zippel and Ferree 2019). The goal to translate social science concepts into practice in order to (re)contribute to knowledge about change (re)ignited key debates in the sociology of gender and feminist scholarship about the complicated relationships between theory and practice.

There exists a large body of research focused on how concepts are used to promote organizational change. Theoretical concepts have an intellectual history and a practical history when advocates translate them into organizational contexts. The concept of diversity, for example, while initially used to mitigate institutional racism and oppression, was translated into organizational practices and policies within human resources departments and law firms to comply (if only symbolically) with antidiscrimination laws (Dobbin and Kalev 2018; Nakamura and Edelman 2019). As the concept became institutionalized, it often obscured rather than addressed racism and reinscribed racialized systems of oppression (Ahmed 2012). The concept of inequality had a similar trajectory. As concerns about inequality were institutionalized in the United States, the concept was used to expand individual opportunity in the workplace at the expense of supporting social welfare policies or actual wealth redistribution, thereby reinforcing class-based power dynamics (McCall 2013).

Research that studies change as a gendered social process sheds light on transformation processes, revealing where gender, power, and resistance are embedded within organizations and identifying institutional features that are variously vulnerable to pressures for feminist reform (Acker 2006; Bird 2011; Van den Brink and Benschop 2012). Following this body of literature, we draw implications about the path implicit bias

has taken as a conceptual tool for gender change in organizations. We analyze the trajectory of implicit bias within the ADVANCE program with a focus on the construction of the problem such interventions sought to solve (Bacchi 1999), identification of how the concept was used to diagnose and frame solutions (Verloo 2007), and examination of the implications of power and agency as theory becomes practice. We build on existing scholarship to better understand how concepts can be stretched and bent, and how meanings get attached or detached, as practitioners transform concepts to promote organizational change (Lombardo and Verloo 2009). The ADVANCE program, we argue, provides an important opportunity to examine the sustained and multifaceted attempts to use theoretical concepts to effect organizational change within a gendered institution.

The ADVANCE Program and Transformations in Higher Education

NSF established the ADVANCE program out of concern for the persistent underrepresentation of women in the professoriate and academic leadership positions in STEM, despite growing numbers of women earning undergraduate and graduate degrees in these fields. Since 2001, ADVANCE has been a major force behind U.S. universities' efforts to promote gender equity; NSF invested over $270 million to support more than 275 ADVANCE awards to upwards of 195 colleges, universities, and STEM nonprofit organizations. By promoting systemic changes with evidence-based models, ADVANCE shifted attention from "fixing the women" to "fixing the institutions" (Sturm 2006). ADVANCE grants support innovative interventions and policies focused on mentoring, networking, professional development, work–life balance, and (department) culture, among others, with the goal of achieving more gender parity in faculty hiring, promotion, retention, and advancement to leadership positions.

Scholarship on ADVANCE's origins and development, successes and challenges, and specific interventions is growing, with more than 400 publications to date (Bilimoria and Liang 2012; Culpepper et al. 2020; Fox 2008; Laursen and De Welde 2019; Stewart and Valian 2018; for an overview, see DeAro, Bird, and Ryan 2019; Zippel and Ferree 2019). This literature celebrates the program's achievements while being an important critical force. For example, when research pointed to programmatic omissions, such as an inattention to intersectionality, the NSF responded by adding intersectionality as a guiding concept to its solicitation in 2016,

demonstrating the learning process of the program itself (Corneille et al. 2019; Hunt et al. 2012; Laursen and De Welde 2019).

This scholarship also confirmed the prominence of implicit bias as a conceptual tool at ADVANCE institutional transformation (IT) sites. Morimoto et al. (2013) found that "cognitive gender schemas"—defined as "cognitive biases in expectations and performance evaluations [and] unconscious understanding of sex differences"—ranked fifth among all ADVANCE initiatives, proposed in 28 of 37 proposals during the first four cohorts (which started between 2001 and 2008). Focusing on five of the seven IT sites in the subsequent cohort (the fifth cohort in 2010), Hutchins and Kovach (2019, 81) found that of 73 project interventions, bias and cognitive gender schemas was the third most frequently used category. Thus, implicit bias is an important concept in ADVANCE, though certainly not the only one that programs used.

Implicit Bias

Historically, the term *bias* referenced measurable gender imbalances or disparities, such as in salaries or health outcomes. The concept of *implicit* bias instead focuses attention on the unconscious ways prejudice can influence behavior. The theoretical foundations of implicit bias can be loosely traced to social psychological research on implicit cognition in the 1970s and 1980s (Greenwald and Lai 2020). This research took aim at the taken-for-granted notion that individuals could report accurately and honestly about their decision-making processes. Although debates continue in psychology about how much implicit bias is actually measurable and how much it contributes to inequality (see, e.g., Forscher et al. 2019), the scholarship on implicit bias is now vast and is not limited to one field of study; psychology, social psychology, sociology, criminology, health care, and law have each employed the concept (for an overview, see Greenwald and Lai 2020).

Scholarly debates notwithstanding, over the past decade mentions of implicit bias have proliferated in scholarly and public literature as well as in industry and politics. Reflecting its mass appeal, Google introduced its "Unconscious Bias @ Work" campaign in 2013, and presidential candidate Hillary Clinton used the concept in the first presidential debate in 2016 (Hensch 2016). Implicit bias trainings and workshops have become the norm in industry, government, and academia (Dobbin and Kalev 2018; Nakamura and Edelman 2019).

What explains the success of implicit bias as a concept? Using the ADVANCE program as a case study, we examine when, how, and why

implicit bias became a useful conceptual tool for practitioners and the tensions for feminist-inspired change processes that emerged from its application. Implicit bias can be successfully adopted in knowledge-producing institutions but can also significantly limit organizational transformation. Understanding this dynamic offers important insights into how practitioners can best use academic theories to promote organizational change.

DATA AND METHODS

Our research uses three primary data sources: (1) ADVANCE documents, (2) interviews with key ADVANCE practitioners, and (3) direct observation of training programs on implicit bias. Our text corpus includes 80 proposals: 60 project proposals and 20 social science proposals from the 70 funded IT sites between 2001 and 2018, and all abstracts of those 70 IT grants and 163 smaller non-IT grants.[3,4] We additionally conducted 11 semistructured interviews with respondents using a purposive sample from early and later cohorts, different disciplines and roles on ADVANCE grants, sites where implicit bias interventions were key and sites where they were not. Of the 11 interviewed, all were women, seven were principal investigators (PIs), four were project directors, and two were social science researchers who also did research related to ADVANCE (some had multiple roles). There was at least one interview with a person from seven of the nine grant cohorts.[5] Interviews averaged 60 minutes (range, 45–90 minutes). With respondent permission, nine were taped and transcribed. To explore how individuals learned about the concept of implicit bias and used it in the context of ADVANCE, a key question was "Do you remember when you first heard the term implicit bias?" followed by probes about their thoughts on its strengths and weaknesses.

We also used informal interviews and observations from more than 20 on-campus awareness and best practice programs (1.5 hours each) conducted across the United States between 2008 and 2019. These programs were aimed at curbing bias in search committees and were conducted by one of the authors. We supplemented the above data with keyword search data from two databases from ProQuest: their database of newspapers and magazines, and their database of scholarly journals. For both, we filtered for English language and excluded Federal, Congress News, and the University Wire databases.

We used a combination of in-depth analyses of interview transcripts and ADVANCE documents, computational analyses of the ADVANCE text documents, and broad keyword searches from the ProQuest databases

to achieve breadth and depth in our findings. Our analytic approach was data-driven and inductive. As with grounded and abductive theory approaches (Tavory and Timmermans 2014), we moved back and forth among data, our output from analyses, and our reflections on the data and analyses, until both authors concluded that we had saturated the theory-generating potential of data and output.

Our analysis proceeded in three steps, targeting the macro-, meso-, and micro-level. To get a macro-level view of the growth in implicit bias as a concept beyond its use in the ADVANCE program, we counted the number of articles/documents indexed in ProQuest that mentioned the phrase *implicit bias* for each year from 1995 to 2019 in English-language newspaper and magazine articles and in English-language scholarly journals.

At the meso-level, we used semantic networks to capture when and how the concept of implicit bias became increasingly central to ADVANCE discourse. We mapped the connection between the word *bias* and 20 other core words in the 80 ADVANCE IT grant proposals. To identify core words, we produced a frequency count of all words appearing in any of the 80 IT grant proposals. Of these, we retained only words that appeared in at least one document from every grant year. We then identified the 20 most frequently occurring words across all 80 grant proposals. We considered this final compilation of 20 words to be the stable, or core, words anchoring the ADVANCE discourse across all 18 years.[6]

The concept of *implicit bias* was indicated differently in these proposals, termed as *subtle, unconscious, cultural*, and the like. In most cases, however, we found the word *bias* was used in the precise way that is meant by *implicit bias* (see online Methods Appendix for details). We thus constructed the final semantic networks by treating the 20 anchor words as nodes plus the word *bias* as the final node.

To examine how the word *bias* related to the core ADVANCE discourse, we extracted every sentence with the word *bias* and added a link (otherwise known as an edge or tie) between nodes if the words co-occurred in these sentences. For example, the sentence "As a result of the departmental bias training . . . , search committee members will undergo implicit bias training" resulted in a link between *bias* and the core word *depart* (the stem of the word department) in the semantic network. We did this separately by year for a total of 10 networks.[7] More than simply counting the use of the word *bias*, these semantic networks create a meso-level visual representation of the changing position of the concept of *bias* within the core ADVANCE discourse over time.

At the micro-level, we did a qualitative deep dive into ADVANCE documents to understand why the concept of *bias* was used by ADVANCE

actors and how they understood the role of *bias* within the ADVANCE program. This phase of analysis included 163 abstracts from the non-IT grants in addition to the interview transcripts and participant observations. We first extracted every sentence in the combined ADVANCE documents and interview transcripts mentioning the word *bias*. We then did an interpretive reading of these sentences and the surrounding context of each mention, noting in memos the themes and reflections that emerged. This process resulted in a list of explicit features of the concept of implicit bias as identified from the grant writers, program participants, and/or those we interviewed. Through discussion and further memo taking, and consultation of secondary literature and notes from the informal interviews and observations, we inductively clustered these features into the umbrella concepts described below.

THE GROWTH OF IMPLICIT BIAS: WHEN AND HOW

ADVANCE teams have found implicit bias to be a convincing concept to jump- or re-start conversations around sexism and discrimination by drawing on a body of theories and research that is not expressly feminist or exclusively about gender. Advocates have used the concept to tell a compelling story, one that supports an implicitly feminist understanding that women and minorities are not judged on individual qualifications but on societal stereotypes and gendered beliefs that inadvertently affect individual decisions. In STEM fields, this argument translates to decision makers unwittingly basing hiring and promotion decisions on gendered beliefs that women (and some underrepresented minorities) are less capable of math and logic, less competent as leaders, or less career-oriented because of mothering (Ridgeway and Correll 2004; Valian 1998). These (common) errors in judgment lead to disadvantages that explain in part the underrepresentation of white women and minority groups in academia and science. ADVANCE sites have additionally found the concept of implicit bias a powerful way to convince leadership and (STEM) faculty to take seriously the issue of gender inequalities in STEM fields.

The increasing use of implicit bias as a core concept in ADVANCE emerged through an interaction between ADVANCE advocates and the NSF. The first IT proposal to use *bias* in the abstract was CUNY Hunter College in the first cohort, led by social psychologists Virginia Valian (PI) and Vita Rabinowitz (Co-PI). Valian's classic book *Why So Slow?* (1998) identified gender schemata as a key explanation of women's slow advancement and called for organizational change to mitigate bias. The

book (published by MIT Press) coincided with the start of the NSF program that shifted away from targeting individual women to solve the underrepresentation problem and toward institutional change. Valian's book circulated among STEM faculty and top leadership in universities interested in applying for ADVANCE grants and was cited in 21 of the 80 IT proposals in addition to the NSF solicitation itself in 2005.

Three other IT sites in the early cohorts developed initiatives related to implicit bias. The University of Michigan's STRIDE program (Committee on Strategies and Tactics for Recruiting to Improve Diversity and Excellence), led by PI Abigail Stewart (2003), created faculty-led programs, including theater performances, to demonstrate the concept. The University of Wisconsin's WISELI (Women in Science & Engineering Leadership Institute) program, led by PI Molly Carnes and Co-PI Jo Handelsman (2004), introduced training programs for search committees that illustrated the concept of bias in presentations, guidebooks and brochures, and designed empirical studies to test the efficacy of their efforts. Georgia Tech, led by Co-PI Mary Frank Fox (2007), developed an online interactive tool to reduce bias that focused on Awareness of Decisions in Evaluating Promotion and Tenure (ADEPT). Future IT and non-IT sites built on these early models (DeAro, Bird, and Ryan 2019).[8]

NSF stressed the importance of implicit bias by citing the NSF-funded report by the National Academy of Sciences (NAS 2007), *Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering*, in its 2007 solicitation; and in 2009, the ADVANCE solicitation referred to the concept in a longer list of summarized studies about possible explanations of the underrepresentation of women in STEM. It pointed to the usefulness of the concept for communication with campus stakeholders to gain their support.

The official use of the phrase *implicit bias* in the NSF solicitation followed the movement of the word *bias* into the core ADVANCE discourse. Figure 1 shows how the position of the word *bias* vis-à-vis the core discourse has shifted over time. The concept had been peripheral to the core, stable discourse in the early years of the program, but by 2008, it was fully incorporated.

In 2001, the word *bias* never co-occurred more than once with any of the anchor words. Though present, *bias* was a term used in passing or in references but not part of sustained discussion. In 2002, the word *bias* moved from the periphery to being part of the ADVANCE program, co-occurring multiple times with the anchor words most closely related to the program—*advance*, *science*, *women*, *gender*, and *faculty*. This shift sug-

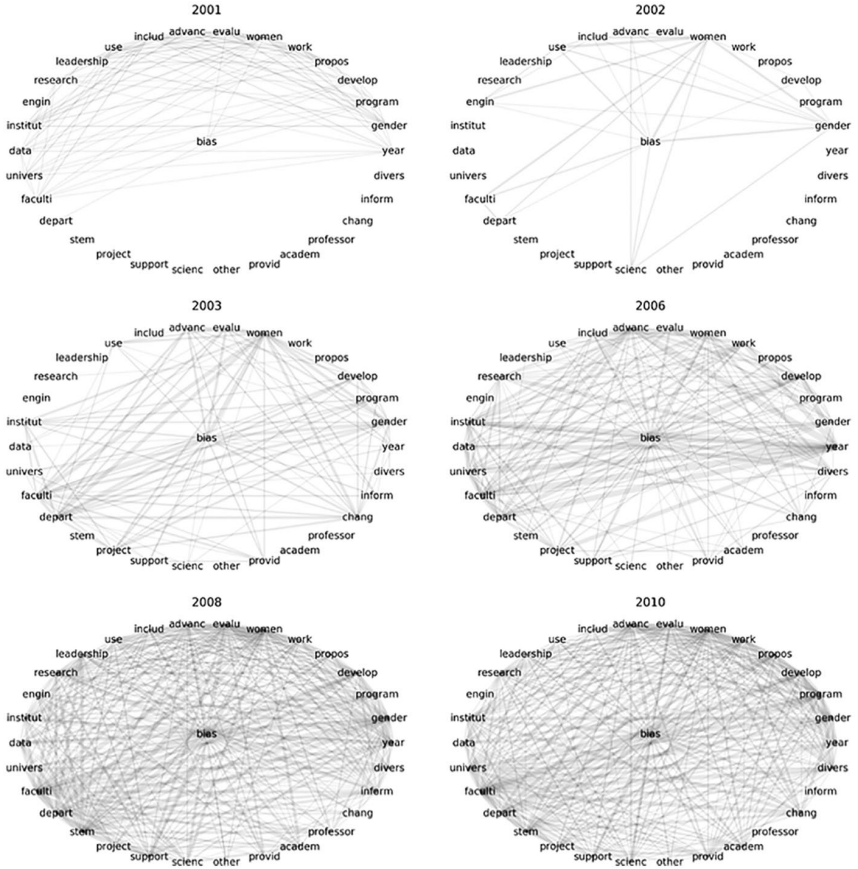

FIGURE 1: Semantic Networks of Sentences Containing the Word *Bias* in 80 ADVANCE IT Project and Social Science Proposals, by Year

NOTE: This figure illustrates the change of the position of the term *bias* in relation to the stable ADVANCE discourse by showing the density of its co-occurrence edges with selected stems/keywords. To create the co-occurrence network, we took the Advance IT proposals awarded between 2001 and 2010 and kept only sentences where the word *bias* appeared. We stemmed unigrams from these sentences and created a co-occurrence network based on their co-appearance with the selected stems/keywords. For example, if the stem *advanc* appeared 12 times with the term *bias* in all the selected sentences, we created an edge between *advanc* and *bias* with an edge weight of 12. When visualizing the edges, we transform the edge weight by taking their logarithm.

gests that the first sustained use of the concept of bias was in relationship to ADVANCE as a program rather than the proposed interventions. In 2003, the word *bias* expanded beyond programmatic discourse and

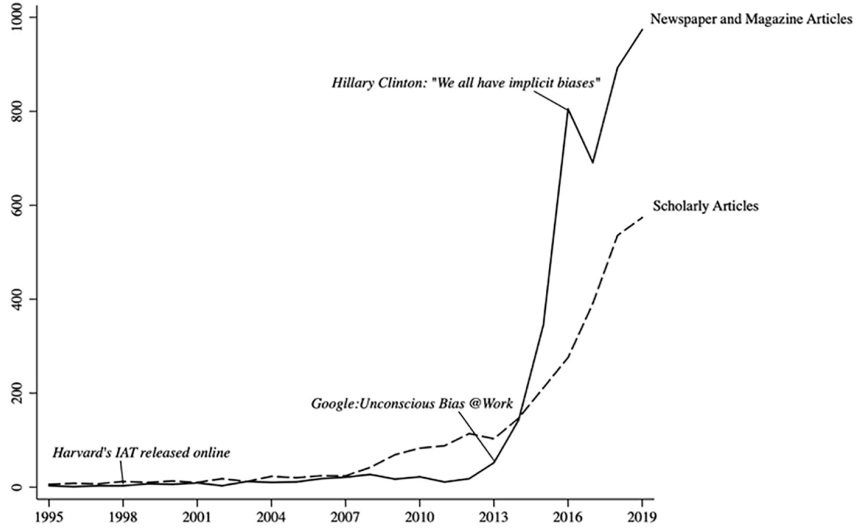

FIGURE 2: Number of Stories by Year in the News Media and Scholarly Publications that Mention *Implicit Bias* Between 1995 and 2019

NOTE: This graph represents the number of articles published in Anglophone popular media and scholarly outlets that mention the phrase *implicit bias* between 1995 and 2019. Results include newspapers and magazines in the ProQuest database, filtered for English language, and excluding Federal, Congress News and the University Wire databases. Three important historical moments are noted for context: Harvard's IAT online release (1998), Google's program Unconscious Bias @ Work (2013), and Hillary Clinton's notable mention that "We all have implicit biases" (Hensch 2016).

became part of the discourse about specific organizational entities within the university (*department*, *program*, *institution*), and specific goals and practices (*change, evaluation*). In 2006, the centrality of *bias* to the core ADVANCE discourse intensified, and by 2008, following publication of the NAS *Beyond Bias and Barriers* report (2007), it was fully incorporated, connecting multiple times to every anchor word in the core ADVANCE discourse. A qualitative reading of the use of the word *bias* in these proposals confirmed this interpretation (see online Methods Appendix for details and examples of how *bias* moved from discursive periphery to core).

The introduction of the term *bias* to the ADVANCE program in 2001, and its full integration into the core discourse by 2008, preceded the use of the concept in popular discourse. Figure 2 shows the number of academic articles and stories in news media that mention *implicit bias* over

time. Figure 2 suggests that bias was picked up in academic publications before the concept proliferated in mainstream discourse.

In sum, our qualitative and quantitative data suggest that implicit bias emerged and grew as a concept first in the scientific context, and later diffused into popular discourse. Its popularity in the ADVANCE program had multiple co-constituent sources including the positive experiences that IT sites had using it, the dissemination of such experiences and associated materials between sites (with NSF-funded brochures, websites, meetings, conferences, and guest talks), and the feedback NSF program directors received about the concept's tractability. Emerging scientific research worked in conjunction with the highly visible Project Implicit test in 1998 to legitimize the concept in scholarly and popular literature. Thus, implicit bias was already part of the ADVANCE core discourse by 2006, before its use in the 2007 NSF solicitation. That endorsement only solidified the centrality of the concept of implicit bias, as its growing diffusion created a feedback loop in which its use as a conceptual tool for tackling gender inequalities became nothing short of a normative expectation.[9]

The trajectory of the concept of implicit bias is impressive, with its legitimization in scientific discourse in the 1990s, its introduction to ADVANCE in 2001 and rapid growth beginning in 2002, its expansion in the scientific context after 2006, and its dissemination into popular discourse and practice starting around 2013. Yet *why* was this concept so successful? *What* enabled its successful translation from theory to widespread practice?

We identified five key features of implicit bias that made the concept a powerful yet problematic tool for institutional change projects. The concept of implicit bias, we argue, is (1) demonstrable, (2) relatable, (3) versatile, (4) actionable, and (5) impartial. While these features are likely to be significant in many institutions, we discuss how they were distinctly important in the setting of STEM fields in higher education.

FROM THEORY TO PRACTICE: WHY SOME IDEAS ARE TRACTABLE

Implicit Bias Is Demonstrable

The persuasiveness of implicit bias as a concept in an academic, scientific context is grounded in its usefulness in research. The concept can be operationalized and tested with quantitative, causal, and experimental

methods (the current gold standard in science), and the outcomes can be objectively measured with these same scientific tools.

Our analysis demonstrates that advocates of equality have strategically used scientific research methods to show that bias is a real problem in need of a solution, and that deeper, more structural organizational change is needed to achieve this goal. As Doreen, a social scientist PI pointed out:

> I think it's been *very, very, very well established that we all act with implicit bias.* And so, it's not an open question. It's not like, "Is there really implicit bias?" It's an issue of, "in what context can we mitigate it?" . . . people *really need a way to name something* and, in a way *that people can understand*, and *they need to be able to prove it*. There has been some really good work proving the existence of it in varied contexts, in very solid empirical ways, that were convincing. (emphases added)

Part of what made bias a compelling concept was the involvement of people in high-status universities, particularly from Professor Mahzarin Banaji (first at Yale and then at Harvard), who bolstered its legitimacy with the Project Implicit IAT test. All interviewees mentioned the Harvard Project Implicit without being prompted, and a social science PI explained:

> For us in the ADVANCE community, we focus on STEM disciplines, so it's important that people understand that this work is important scientifically. And so [it] has really helped that Harvard has taken [the concept of bias] on as a scientific research question. . . . That has added legitimacy.

In the past, typical explanations for the underrepresentation of women in STEM have depicted it as a simple "pipeline" problem, or as the result of individual choices rooted in gendered socialization (NAS 2007). In the ADVANCE community, implicit bias, has been used to direct attention to flawed decision making in organizations. Despite some controversy among psychologists about the measurement of implicit bias, our observations of evidence-based training on bias refer explicitly to multiple experimental studies, which STEM audiences usually accept as evidence. Demonstrability through scientifically acceptable methods used in highly prestigious institutions was thus crucial to legitimate the concept of implicit bias in academic settings, and even more so for a program such as ADVANCE, which seeks to convince scientists and engineers in STEM departments and colleges.

Demonstrability also limited the concept's transformative potential. A major drawback is the reduction of gender inequalities to *directly* measurable

(gender) differences. Although some gendered outcomes of individual decision making are quantifiable, organizational practices that depend heavily on context have multi-causal factors that lead to subtler gendered differences, which are more difficult to tease out with experimental designs. Factors that have not been demonstrated in a positivist sense do not typically get the same attention as those that have, even when such factors (e.g., an unfair gendered division of labor or the [symbolic] devaluation of feminist research) are vital to the production of gender inequality (see Nielsen 2021). The privileging of demonstrability reinforces the (gendered) belief that only what is measurable is meaningful, and that everything that is meaningful can be measured. This has left a host of crucial issues in the organizational realm out of the conversation.

Implicit Bias Is Relatable

In addition to being testable and demonstrable using scientific methods, the concept of implicit bias is also relatable. A relatable, or experiential, concept is one that people can grasp through their experience; individuals can have empathy for what it feels like to be a target/victim of bias as well as an (unintended) perpetrator. Implicit bias has given language to injustices in a way that those who feel "wronged" can voice their concerns to those in power in a nonthreatening way. A social scientist involved in ADVANCE explained the concept as an interpretive device for addressing those in power:

> [Implicit bias] provided an explanation . . . that was provable, that many people who'd been experiencing implicit bias could use to translate [their experience] to both willing and unwilling actors around them.

Awareness and educational efforts draw on a large body of research showing how human beings use schemata, and how the brain can trick people into selective perception. That the brain is neurologically perceptive to "bias" can create epiphanies for scientifically minded people, as a social scientist who leads unconscious bias trainings explained:

> It's very easy when doing unconscious bias training to talk about unconscious bias as being a *category of perceptual biases*. You could show people all these little puzzles where they don't see things that are in the room. Or they think one box is bigger than the other when it's not. It's kind of these *mind bugs* as people call them. . . . The scientists and engineers really geek out on this idea of perceptual biases. . . . So, it's a good way to convince and engage smart people. (emphases added)

Because the concept of implicit bias can become tangible to scientists and engineers through tests, mind teasers, word and image puzzles, or visually through graphs and videos, mind play can lead to life-changing "aha!" moments. We find that rather than confronting people with "being sexist" or "unenlightened," educators create a setting in which individuals can discover on their own that their brains can fool them when they least expect it. Experiential knowledge can help to motivate change by convincing people that they have biases and linking those biases to real consequences for gender inequality.

Like demonstrability, relatability is also a limiting feature. First, it individualizes and normalizes systemic gendered inequalities by fueling the perception that if we are all biased, then bias is inevitable and cannot be changed. Second, similar to the way demonstrability strengthens the idea that everything that is meaningful must be measurable, relatability reinforces the belief that meaningful problems must be experienced by everyone. In other words, "I've never seen or experienced oppression; thus it must not exist." Yet issues that are not directly experienced by those in positions of power are, of course, equally real and consequential for producing gender inequality.

Implicit Bias Is Versatile

In addition to being testable and relatable, that implicit bias is also versatile seems to have added to wider adoption. A concept that is versatile can be applied across different institutions and scenarios, uniting many aspects of a larger issue under one conceptual framework. In the case of ADVANCE, versatility meant that implicit bias could be linked to organizational and cultural change processes, specifically to (peer) evaluations that were relevant to the program's goals to enhance gender equity in recruitment, hiring, retention, and promotion (Fox 2008). Because these evaluation processes are central to the distribution of resources and recognition across different career stages for women professors, the concept of implicit bias had the potential to address inequalities in a variety of ways, including curriculum vitae assessments for hiring and promotion, student evaluations, letters of recommendation, grant selections, service loads, and salaries (Culpepper et al. 2020; for an overview, see Stewart and Valian 2018). Furthermore, because the concept of implicit bias is applicable to gender and other forms of inequalities, ADVANCE proposals could use it to signal intersectionality—an explicit requirement for proposals since 2016—without proposing organizational measures to address it.

TABLE 1: Most Frequent Words Co-occurring in Sentences that Contain the Word *Bias* in 80 ADVANCE IT Project and Social Science Proposals

Word	*Count*
women	241
faculty	218
implicit	115
stem	96
subtle	79
research	76
training	74
advance	62
practices	56
recruitment	56
policies	55
climate	54
evaluation	52
search	51
promotion	50
committee	49
institutional	49
diversity	49
year	48
hiring	47
unconscious	47
change	44
may	43
advancement	42
impact	40

NOTE: Words were converted to lowercase before counting. For example, the words STEM and ADVANCE were capitalized in the proposals, but we present them as stem and advance in the table to accurately represent how we counted the tokens.

Our computational analysis confirms the versatility of implicit bias and its relevance to core ADVANCE discourse. Table 1 shows the most frequent words co-occurring in the same sentence as the word *bias* across all 80 IT proposals.[10] Supporting the reflections above, these words suggest that the concept of bias has been used to frame multiple processes (*evaluation, search, hiring, promotion*, and *training*). *Bias* has been applied across the core concerns of the ADVANCE program and to a variety of other issues associated with women professors in STEM.

However, with versatility comes the potential to stretch a concept to the point of absurdity. When bias is used as *the* single explanation for gender

inequality across every issue related to faculty in STEM fields, it can become a meaningless, catch-all term. The shift from implicit bias as a key influencer of evaluations of women and underrepresented minority groups (leading to unfair treatment) to overly generalized formulations of gender bias in every setting, including careers, the classroom, mentoring, research, international collaborations, artificial intelligence, and so on, can divorce the concept from its grounding in scientific understanding—a feature that made the concept powerful in the first place. Some causes of gender inequity (such as policies around work–life conflict) require complex, institutional solutions that can be crowded out by the desire to bundle everything to the same underlying cause.

Implicit Bias Is Actionable

The concept of implicit bias was incorporated into institutional practice because advocates developed and implemented practical interventional measures and policies. Implicit bias can now be used to potentially address the subtle, previously "hidden" inequalities that accumulate disadvantage in careers over time (Valian 1998). Because the theory of implicit bias does not adequately situate bias within institutions, ADVANCE intentionally linked the concept with institutional responsibility and interventions to curb bias in evaluation and decision-making processes. Virginia Valian (an ADVANCE PI) explained the importance of institutional measures: "I will make these mistakes myself, so I need practices and policies that prevent me from making these unintentional errors." The assumption is that organizations can raise awareness of individual bias as well as create and redesign policies, procedures, and initiatives to mitigate the impact of bias at the structural level. These actions can promote gender equality through institutional change (see Stewart and Valian 2018).

Therefore, ADVANCE sites developed action-oriented presentations, training programs, and campus-wide campaigns to engage top-level administrators on how to revise policies and "train" faculty who serve on search and tenure and promotion committees. According to a project director, talking to faculty search committees is "doable" and implicit bias is "tangible." Such features worked well with events such as an ice cream social that funneled its attendees to take Harvard's Project Implicit test, an online Bingo game, and other playful, easy-to-do tutorials on inequality.

Conceptually informed but practical and immediate actions to solve circumscribable problems contributed to the tractability of implicit bias. Yet a concept that so easily transforms into the concrete is necessarily

self-limiting. In particular, programs that focus on *individual* awareness—a common theme in ADVANCE programs—made them feasible in the change-averse context of higher education, but at the same time further obfuscated the structural causes and consequences of bias. The theory of implicit bias itself predicts that at best, bias is very difficult to eliminate: Its origins are societally rooted, seemingly unbreakable gender schemata that do not necessarily lead to behavioral change even when attitudes change (Forscher et al. 2019). Palatable solutions to inequality, such as the ice cream social, while important to a larger change strategy, can individualize and trivialize a problem with deep roots. If issues are meaningful only if measurable, and issues are real only if relatable, the actionability feature suggests that only problems that can be addressed in small, achievable chunks can be solved.

Implicit Bias Is Impartial

Politically charged concepts often provoke resistance, especially from audiences unfriendly to ideas of feminist change or social justice. But a concept that frames problems in impartial ways—that is, which potentially affects everyone involved and offers solutions with encompassing benefit and without assigning blame—is less likely to incite resistance. As a project director explained:

> [Implicit bias] is less threatening to people who don't think that they're racist or sexist. It gives you a little bit of an easier conversation . . . that we all have these biases, both men and women. And they are cultural, and we can work to identify them and overcome them, but we're not bad people.

To receive institutional buy-in, the concept of implicit bias needed to be compatible with the agendas of those in power who did not innately view themselves as biased. The solutions that ADVANCE programs implemented in response to bias aligned with the scientific method and academia's commitment to egalitarianism and education. A narrow interpretation of bias does not challenge objectivity or meritocracy—the core values of scientists and academics (Jenkins 2018; Merton 1968; Stewart and Valian 2018). Additionally, because the concept diffuses individual blame and is not limited to gender, its applicability to other forms of inequality[11] broadened its reach to potential allies and appeared less radical and less "feminist."

There are drawbacks, of course, to making concepts palatable to those in positions of power. By excusing individual and institutional culpability,

the concept of implicit bias often does not provide a clear link to how organizations are implicated in perpetuating gender inequalities. There is thus a need to balance impartiality with the desire to institute *effective* organizational change.

In sum, these five features—demonstrability, relatability, versatility, actionability, and impartiality—enabled the widespread application of the concept of implicit bias in practice, but also limited its transformative effects. These findings have implications for how we understand change efforts more broadly.

LEARNING FROM PRACTICE

Implicit bias exemplifies an academic concept that successfully translated into practical steps in projects ostensibly created to promote organizational change. While the five features we identified were based on in-depth analysis of the ADVANCE program, we believe these features to be relevant for many different programs and across institutions. That the concept of implicit bias has gained traction in multiple spaces, including (the technology) industry, police departments and other governmental institutions, schools, the upper halls of the U.S. government (all the way to presidential candidate Hillary Clinton), and internationally is evidence that this phenomenon goes far beyond ADVANCE (see, e.g., Figure 2) and the United States. While the specific ways these five features may be implemented will likely vary across institutions and countries, we believe that in many cases they will *all* be important.

A brief comparison between the concepts of *bias* and *diversity* emphasizes the significance of these five features, and also the importance of context to the success of ideas. The concept of *diversity* has always been at the core of the ADVANCE program. *Diversity* is mentioned far more frequently than the concept of *bias*, in both the ADVANCE program and in popular and scientific discourse (the word *diversity* occurs close to twice as often in the 80 grant proposals in our corpus as does the word *bias*). Yet diversity as a concept has not achieved practical application in the way implicit bias has done. Although the concept of diversity has many of the same features as implicit bias—it is, for example, versatile, measurable, and demonstrable, and it can be addressed in ways that do not necessarily threaten power structures—it is not *actionable* in the same way, particularly in programs such as ADVANCE.

Within the complex and change-resistant context of higher education, the ability to implement specific but narrow actions for change (such as

addressing implicit bias in faculty search committees) is far more feasible than instituting changes that require decision-making power usually beyond the scope of ADVANCE programs (such as creating funding for new faculty positions). Although diversity is an important goal of the NSF ADVANCE program, it requires collective solutions beyond the scope of a single program or one specific intervention. Unlike the concept of implicit bias, the concept of diversity does not imply feasible, incremental, and concrete steps.

As this brief comparison suggests, understanding the processes through which *implicit bias* has been both transformative and limited in its transformative potential through the ADVANCE program can provide key insights for advocates doing this type of work.

First, our findings suggest that clear, actionable, and immediate steps for institutions to take are necessary for a social change concept to take hold (Correll 2017), but these incremental steps can have serious drawbacks. Conventional forms of business diversity training programs, for example, have been shown to be ineffective at best, and can lead to greater resistance and negative outcomes for white women and minorities (see Dobbin and Kalev 2018). A recent meta-analysis of research on business diversity training explained that such training *can* be useful if it has multiple measures, includes both awareness and skills development, and occurs more than once "over a significant period of time" (Bezrukova et al. 2016). Many ADVANCE sites have these components. STRIDE sites experimented with extensive curricula, including multistage training; other sites held two-week intensives and up to 12-week programs. Such innovative ADVANCE training programs have been found to achieve positive effects on STEM faculty, including increased self-reported awareness of bias and changes in attitudes, increased self-efficacy to promote gender equality, and positive hiring outcomes for women faculty (Carnes et al. 2015; Devine et al. 2017).

Second, the features of demonstrability and relatability help concepts to gain leverage in certain contexts, such as higher education. Both features, however, can individualize inequalities at the expense of identifying structural roots. Similar to actionability, there are still ways to leverage these features to promote greater structural understanding. With experimental methods, scholars have found that exposure to certain types of information about economic inequality in the United States (McCall et al. 2017) and the individualized framing of immigration issues (Bloemraad, Silva, and Voss 2016) generate structural understanding and support for systemwide solutions to these problems. There are thus evidence-based ways in which

scholars and practitioners can leverage the individual understanding of an issue such as *implicit bias* to promote systemic change.

Third, although the feature of versatility can promote broad adoption of a concept, it can also lead to "concept creep" and other unintended consequences. A subgroup effect can occur in which the same framework has opposite effects for different groups of people or when applied to different issues within the same subgroup (Bloemraad et al. 2016). It is prudent to be cautious when stretching a concept beyond reasonable boundaries, weighing the desire for versatility against the need for effectiveness, and using evidence-based methods to develop an appropriate scope. In short, awareness of a concept's features as both enabling and constraining, as we emphasized throughout, can help advocates to push beyond its limitations.

CONCLUSION

Our research uses the concept of implicit bias in the ADVANCE program as a case study to examine the translation of a feminist-informed theory into practical change within a gendered institution: STEM fields in higher education. Although higher education is an example of a deeply gendered institution, it has distinctive features that distinguish it from others, such as industry or government. In principle, academia is dedicated to the values of education, objectivity, meritocracy, the scientific method, and the transformative potential of the liberal arts. It is also invested in a market-oriented logic that relies on academic output, prestige, and status. Within this context, higher value is placed on seemingly objective measures to "prove" that a mechanism or idea practically exists and leads to predictable outcomes. Demonstrability in academia, particularly STEM disciplines, takes the form of positivist science, whereas in other contexts a different form of demonstrability may be more persuasive; so too with the other four features. Although we cannot apply lessons learned from higher education directly to other settings, learning from cases where theory, even when fraught, does translate successfully into practice contributes to a general understanding of institutional change.

ADVANCE advocates aimed to change *organizational* practices, procedures, and policies to minimize or curb implicit bias in decision making, yet redesigning, implementing, and sustaining these changes remain challenging (Stewart and Valian 2018; Valian 1998). In addition, there is tension between the compatibility of the concept of implicit bias with the core values of academia and its use for exposing gender inequalities,

oppression, privilege, and epistemic injustices. It is fairly straightforward to convince people, in principle, to apply benchmarks for excellence in the same way across groups (respecting the values of egalitarianism, meritocracy, and objectivity), but it is more difficult to challenge the (exclusionary) gender biases inherent in those measures (Jenkins 2018; Nielsen 2021; Stewart and Valian 2018). There is thus a delicate balance between framing a concept to be acceptable within a particular ethos and diminishing (or even eliminating) aspects of the concept that may address the roots of inequality more effectively.

As we celebrate the successes of implicit bias as a transformative and translatable concept for gender organizational change, we must remain productively critical of its use and allow our insights to inform and expand future research and attempts at change. Our hunch is that the individualization of gender equity through the concept of *implicit bias* in U.S. universities is not simply part of American political culture. Instead, we propose that the reduction of deep-seated structural inequalities to individual cognition is a result of gender politics that emphasize an individualized model of anti-discrimination together with a lack of state regulation. Programs tend toward ideas that fit existing frameworks, such as discrimination by individuals, rather than those that demand attention to the intersectional structures of inequality that are embedded in organizations themselves. To identify which conceptual features may be important in different institutional and national contexts or in what circumstances they may be necessary or sufficient for other types of change processes, further studies could build on our and other case studies (e.g., Ahmed 2012; McCall et al. 2017) or take a more directly comparative approach.

It is not within the scope of this paper, nor was it our intention, to evaluate whether changes attributable to the concept of implicit bias implemented through ADVANCE were indeed effective or transformative. As noted previously, other researchers have taken on this task. Our goal for this study was to examine how and why the concept of implicit bias gained traction in the ADVANCE program, noting both the affordances and constraints of five key features that facilitated tractability. These five features can help practitioners across institutions to think through how to best translate concepts and ideas into practice to obtain the most support in their efforts for organizational change. The actual impact of translating ideas into practice will be in how those ideas are applied in practice to effect change (in our case, to effect organizational change). With awareness of the strengths and limitations of these five features, practitioners can work consciously to mitigate potential barriers to specific change

goals, whether those goals are policy change, organizational change, or more foundational equity change.

ORCID iD

Laura K. Nelson https://orcid.org/0000-0001-8948-300X

NOTES

1. American Association for the Advancement of Science honored them with the prestigious 2018 Golden Goose Award, which recognizes a major breakthrough with exceptional social impact in policy, business, and law.

2. Organizational Change for Gender Equity in STEM academic professions; https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5383 (accessed December 8, 2020).

3. Our sample includes proposals we could locate online or were sent to us on request. We were able to collect 60 of the 70 sixteen-page project proposals (86 percent) and 20 of the 29 five-page social science research proposals (66 percent). See online Methods Appendix for more details.

4. IT grants are usually five-year awards with $3.3 million on average; shorter and smaller grants include Leadership, PAID, PLAN, IT-Catalysts, and others.

5. We did not interview anyone from the 2012 or 2016 cohorts.

6. Twenty nodes is around the number of nodes you would want in a network visualization to be able to see in enough detail connections between nodes. Given our desire to visualize the broad strokes of the ADVANCE program discourse, increasing or decreasing this number would not change the broad contours of the semantic network. Before counting words we converted to lowercase, we removed stop words and punctuation, and we stemmed the words using the Porter Stemmer algorithm.

7. ADVANCE grants were not awarded every year between 2001 and 2018. For the sake of visual clarity, we show only the networks until 2010. These first six semantic networks capture the most variance in use of the word *bias*.

8. For example, 14 of the 80 IT project and social science proposals mentioned the STRIDE program explicitly.

9. Our data form a descriptive analysis of when the concept of implicit bias was introduced and when it grew in use in scientific and popular discourse. We do not suggest a causal connection between the two, nor do we analyze the role of ADVANCE in this diffusion. These are subjects for future research.

10. After removing stop words, or the most frequent words in a language that typically do not convey content, such as the, and, and of.

11. Bias has been measured for many different minority groups based on race, religion, sexual orientation, and health status in the United States and internationally. http://www.peoplefas.harvard.edu/~banaji

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Laura K. Nelson is an assistant professor of sociology at Northeastern University. She uses computational and qualitative methods to study gender, institutions, culture, and social movements. Her work has appeared in Sociological Methods & Research, Sociological Methodology, Mobilization, Poetics, *and* Oxford University Press, *among other outlets.*

Kathrin Zippel is Professor of Sociology at Northeastern University. Her current research explores gender and global transformations of science and education. She is the author of Women in Global Science: Advancing Careers Through International Collaboration *(Stanford University Press). She directs an NSF-funded network analysis to study the diffusion of ideas on gender equity interventions among U.S. Universities.*