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Collectively constructing Gender-Inclusive work cultures in STEM

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ABSTRACT

We review a program of work articulating the concept of inclusion – and approaches for achieving it – for women working in Science, Technology, Engineering, and Maths (STEM) organisations. A multi-level framework is described to characterise inclusion in STEM workplaces. This framework is then used to conceptualise a series of empirical studies exploring women’s experiences of STEM work cultures. Together, these studies show that identity-based inclusion is the product of institutional policies and practices, interpersonal dynamics, and individuals’ beliefs and biases. We then use our multi-level framework to discuss practical insights for creating inclusive cultures in STEM organisations. We offer a series of empirically informed actionable suggestions for spreading and establishing inclusive norms in STEM organisations. Our framework suggests that creating contexts where employees can effectively learn inclusive norms will help organisations construct gender inclusive work cultures in STEM.

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KEYWORDS Inclusion; diversity; STEM; social identity threat; stereotypes; organisations; gender

Introduction

Organisations invest untold resources – estimated at \$8 billion annually (Lipman, 2018), and climbing – to create workplaces where people from diverse groups can successfully learn and work. Yet research suggests that initiatives intended to increase the numeric representation of marginalised minority groups often falter (Ellemers & Rink, 2016), and effects of demographic diversity on group performance remain mixed (Eagly, 2016). Moreover, greater diversity does not guarantee inclusion: Merely getting a “foot in the door” does not automatically ensure an equal voice in decisions or respect for one’s contributions. This potential disconnect highlights a need for theoretical and empirical work exploring strategies for promoting

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inclusion in diverse workplaces. Here, we review a program of work articulating the concept of inclusion – and approaches for achieving it – for women working in Science, Technology, Engineering, and Maths (STEM) organisations.

STEM occupations number among the most lucrative in society, and women's underrepresentation in these careers contributes substantially to gender gaps in salary (European Institute for Gender Equality, 2017). Often, male-dominated STEM workplaces are implicitly structured around the ideal of a masculine default, which can repel some women from these career options and for others, contribute to a lack of felt inclusion within these professions (Cheryan & Markus, 2020). For example, up to 40% of women in engineering and technology exit their careers in the first five years (Fouad et al., 2017). Women in STEM report social isolation, difficulty gaining respect, and gender stereotyping (Rosser & Lane, 2002; Seron et al., 2016), and nearly one-third of women who leave STEM cite an unwelcoming culture as a key factor (Fouad et al., 2017). This turnover is costly for both organisations and individuals (Farris, 1971; Pitts et al., 2011), and demand for highly trained professionals in STEM continues to outstrip supply (Expert Panel on Innovation, 2009). Women, representing roughly half the adult population in most nations, represent a critically underutilised source of STEM talent. Moreover, women's participation and retention in STEM fields are critical for creating socially just and diverse workforces that boost innovation and productivity (Ellemers & Rink, 2016; Hodson et al., 2018) in a field that helps drive the economy (European Institute for Gender Equality, 2017).

Understanding the negative climate facing women in STEM fields requires theory building informed by a keen understanding of the individual, interpersonal, and institutional forces present in an organisation. To this end, we describe a multi-level framework characterising organisational culture as the product of individual psychology, interpersonal experiences, and institutional policy (See Figure 1; Schmader et al., 2020; Stephens et al., 2020). By moving beyond a narrow, exclusive focus on either individual biases or structural disadvantages, our framework offers an integrated approach to understanding inclusion in STEM settings. Although other models of organisational culture consider multiple levels at which culture is communicated (e.g., Schein, 2017), and other theories offer insights into creating respectful and trusting relationships between organisations and their employees (See Leadership-member exchange theory, Graen & Uhl-Bien, 1995), none of this work focuses on cultures of gender inclusion in STEM. Our framework specifically considers unique challenges and opportunities for organisations trying to build a gender-inclusive work culture in STEM. It also yields practical insights into when and why organisational approaches to inclusion may fail or succeed. Creating inclusive spaces using

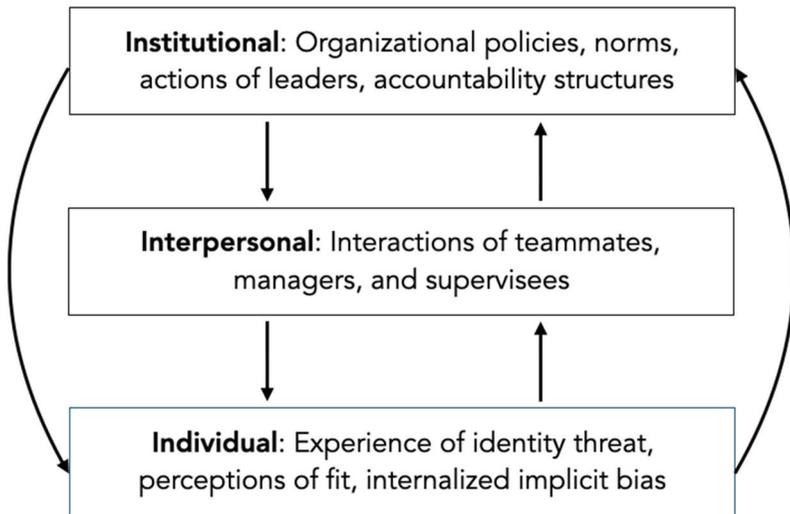


Figure 1. A Tri-level framework of inclusive work culture.

these insights can help foster fit for marginalised individuals (Schmader & Sedikides, 2018) with the potential to maximise their full potential (Walton & Spencer, 2009).

A Tri-level model of organizational inclusion

Our approach to studying organisational culture starts with the idea that people search for a shared understanding of a workplace's culture and their place within it. They do so by engaging with an organisation's social (i.e., the people) and institutional (i.e., dominant ideas, practices, products, and policies) features (Kitayama et al., 2007). Norms, attitudes, and assumptions then emerge within the local workplace culture and become collectively shared, dictating how people interact (Henrich, 2015) and which policies are enacted. By a process of mutual constitution, a shared culture gets established, maintained, and adjusted by individuals, their networks of relationships, and the surrounding organisations or institutions (Markus & Kitayama, 2010).

Building on past theoretical work (Markus et al., 2000; Nishii, 2013; Steele et al., 2002), we define inclusive organisational cultures as affording comprehensive identity safety, wherein all individuals are free from devaluation based on group identities. Our focus is on inclusion and how it can be collectively constructed through multiple channels within an organisation. We look to explore how and what organisations communicate to employees about the value of specific social identities. Within the culture of an

organisation, employees will have experiences bound to their group identities (e.g., “My group is not liked, respected, or accepted here” or “My group is valued, accepted, trusted, and understood by the dominant culture”). As such, marginalised and non-marginalised individuals can have divergent experiences of the same organisation’s culture.

We focus here on inclusion. Inclusion is distinct from diversity (numerical representation of people from different groups) and equity (ensuring that people receive outcomes corresponding to their inputs and removing discriminatory barriers). Whereas diversity is about demographic representation (e.g., how many female engineers are employed at a company) and equity concerns fair processes (e.g., are women’s and men’s merit increases are proportional to their performance metrics), inclusion is a distinctly psychological construct signalled via several channels within an organisation. Inclusion differs from diversity and equity in that it is often (though not exclusively) experienced during interpersonal interactions but also subjectively constructed from the attributions people attach to their experience with a workplace’s culture.

These qualities make inclusion fertile ground for theoretical exploration from the vantage point of the social-psychological literature. Equitable processes and numeric representation can facilitate inclusion, and inclusive cultures might also facilitate policies that enhance equity and diversity. However, other interpersonal channels play an essential role in how an inclusive work culture is created, communicated, and maintained. Thus, it is crucial to build a theoretical model that looks beyond diversity and equity to create cultures of comprehensive identity safety for women in STEM (Markus et al., 2000; Nishii, 2013; Steele et al., 2002)

Biases as barriers to inclusion

When group-based identity creates disparate experiences of workplace culture, this disparity can reflect the influence of subtle (or not-so-subtle) expressions of bias, stemming from the explicit beliefs and implicit attitudes or stereotypes associated with a group (Ellemers, 2018). For example, pervasive beliefs and stereotypes associate the concept of “science” more with men than women, on both explicit (Charlesworth & Banaji, 2019a) and implicit (Nosek et al., 2007) measures. Such stereotypes are held by both men and women, including those who have chosen STEM majors or careers (Nosek et al., 2007).

The mere existence of stereotypes does not make discrimination inevitable but does provide the potential for biased outcomes if people are not motivated (internally or externally) or able to override their stereotypes (Crandall & Eshleman, 2003). Moreover, contemporary forms of bias are

often automatic, ambiguous, and ambivalent (Greenwald & Banaji, 2017), making them difficult for recipients and observers to detect (Plant & Devine, 2003). Despite their sometimes-subtle expression, biases can have important consequences for hiring decisions and academic performance (Moss-Racusin et al., 2012; Walton & Spencer, 2009; Word et al., 1974). Distinct from how stereotypes might suppress diversity (in terms of group representation) or reduce equity in organisations, the subtle and blatant expression of stereotypes also affects marginalised individuals' feelings of inclusion – often operationalised as fit, authenticity, and belonging (Schmader & Sedikides, 2018; Veldman et al., 2021; Walton & Cohen, 2007).

Organisational culture as an engine of inclusion

Central to our theoretical framework is the idea that the organisational culture in STEM workplaces can mitigate experiences of social identity threat. Social identity threat occurs when situational cues make salient the social devaluation of one's group identity (Steele et al., 2002). This concern results in categorisation-related processes whereby a person feels they are seen merely as a member of a devalued group, rather than as an individual (Steele et al., 2002). The experience of social identity threat includes a cocktail of affective, physiological, and cognitive processes that can increase motivation to disconfirm negative stereotypes while also undermining performance (Schmader et al., 2008). The most studied form of social identity threat is stereotype threat (Steele et al., 2002), often defined as social identity threat during a high stakes test or performance situation (Spencer et al., 2016, 1999; Steele & Aronson, 1995). Whereas stereotype threat offers a social psychological explanation for the underperformance of devalued groups in domains where they are negatively stereotyped, social identity threat provides a general theoretical framework to understand identity-based threats across a broader array of contexts and outcomes.

We describe a series of channels through which organisational culture, including embedded biases, is transmitted and reinforced at different levels (Schmader et al., 2020). We suggest that identity-based inclusion is the product of *institutional policies and practices* (Hall et al., 2018), *interpersonal dynamics* (Cyr et al., 2021; Hall et al., 2019, 2015), and *individuals' beliefs and biases* (Block et al., 2018; Régner et al., 2019). We use this framework to organise a series of empirical studies aimed at understanding women's inclusion experiences in STEM organisations.

Empirical Support for our Tri-level Model of Inclusion

Using this multi-level framework, we will summarise our program of research investigating key aspects of inclusive workplace cultures in STEM. We integrate theoretical insights about the mutual constitution of culture and the self (Markus & Kitayama, 2010) with the emerging science of social identity threat and fit (Schmader & Sedikides, 2018; Steele et al., 2002) to explore the cultural context of STEM organisations.

Institutional Features of Inclusion

Cues of devaluation can reside in institutional policies and practices, even without individuals within the organisation endorsing or enacting stereotypes or prejudice. Conversely, policies and practices can also limit discriminatory behaviours and decision-making by deliberately increasing employment opportunities for women and other minorities (Dobbin & Kalev, 2015). Beyond increasing diversity, a growing body of theoretical work – including lab studies – now points to the importance of organisational signals in shaping underrepresented groups' experiences at work (for a review, see Murphy & Taylor, 2012). Organizational signals of diversity and inclusion can lead to more positive attitudes towards an organisation, enhanced trust and identity safety, as well as increased persistence and performance (e.g., Apfelbaum et al., 2016; Purdie-Vaughns et al., 2008; Wilton et al., 2019). However, institutional signals of inclusion can also have unintended effects. The perceived benefactors of inclusive policies may be stigmatised as incompetent or undeserving (Dover et al., 2020; Heilman et al., 1997), Inclusive policies can also create ambiguity as to whether success in an organisation is due to these interventions or policies, rather than individual merit (Ovseiko et al., 2017). Institutional signals of inclusion can also be misleading, fostering denial of bias among majority group members (Dover et al., 2020; Kaiser et al., 2013; Kroeper et al., 2020).

This past research highlights how institutional cues may signal or undermine a sense of inclusion for women and other marginalised groups. However, much of the social psychological research on this topic uses lab paradigms to test the impact of inclusive organisational messaging on a convenience sample of undergraduate students (for review, see Dover et al., 2020). Calls are mounting for research that ventures outside of individualised lab settings to explore how these psychological processes unfold within organisations and interpersonal networks (Emerson & Murphy, 2014; Walton et al., 2015). Our program of work tests whether institutional cues to an inclusive culture predict lower daily experience of social identity threat for women working in STEM fields, perhaps by shaping the quality of workplace interactions.

Organizational Signals of Inclusion

Two institutional cues stand out as candidates for signalling an inclusive organisational culture: demographic diversity and inclusive policies and practices. Others have noted that women's experiences of social identity threat in STEM may be impacted by inclusive institutional practices or the percentage of other women in the setting (Inzlicht & Ben-Zeev, 2000; Murphy et al., 2007). Lab studies find that women in STEM perform better in groups with more equal gender representation, rather than mostly men (Dasgupta et al., 2015; Inzlicht & Ben-Zeev, 2000). Workplaces with policies designed to increase manager accountability and encourage collaboration tend to have more productive female employees who enjoy better relationships with their colleagues (Green & Kalev, 2008). For instance, female scientists perform better in companies with policies to ensure that men and women occupy equal-status roles (Whittington & Smith-Doerr, 2008).

Mechanisms Linking Inclusive Cues to Identity Safety

Theorising from models of social identity threat (Cohen & Garcia, 2008; Schmader et al., 2008), institutional signals of workplace culture in STEM serve as informational cues that can shape individual psychology and behaviour. On the one hand, such signals of gender inclusion could directly imply identity safety within the environment, improving women's perceptions of the workplace regardless of actual interactions with colleagues. For example, institutional signals of inclusion may create expectancies that guide women's day-to-day work experiences: Women who see their workplace as gender inclusive may be less vigilant towards biased behaviour (Kaiser et al., 2006) and more attentive towards cues that disconfirm the potential for bias (Cohen & Garcia, 2008). Even without changing workplace interactions, inclusive institutional messaging could support less gender-based interpretations of negative encounters, thus reducing social identity threat.

Alternatively, institutional signals of inclusion, such as policies or prevalence of women, could reduce threat more indirectly by fostering more positive interpersonal norms between genders in the organisation. Gender-inclusive institutional signals may motivate individuals to avoid gender biases (Devine et al., 2012; Kalinoski et al., 2013) and establish better norms for how they treat members of marginalised groups. For women, these positive interpersonal norms might be linked to lower social identity threat (Logel et al., 2009; Yoshida et al., 2012).

Anticipating Resistance

Although gender-inclusive institutional signals have the potential to encourage inclusive interactions, some people may view these efforts as undermining the status quo, leading to avoidance or conflict. Practices designed to increase workplace diversity can sometimes lead to reactance and resentment

among majority group members (Morrison et al., 2010). Majority group members are typically motivated to protect existing social hierarchies (Sidanius & Pratto, 1999). Such backlash can happen when diversity programmes are implemented poorly, framed as legal obligations, or interpreted as leading to zero-sum outcomes, thereby increasing identity salience and intergroup conflict (Farrell et al., 2021; Fiol et al., 2009; Kuchynka et al., 2018; Paluck, 2006). When majority group members perceive current organisational practices to be fair and equitable, think intergroup relationships are universally positive, or feel that their own group's status in the field is threatened, they express less support for initiatives designed to enhance the status, representation, or inclusion of disadvantaged groups (Danbold & Huo, 2017; Jones et al., 2021; Kay & Friesen, 2011; Wright & Baray, 2012). Thus, when institutional efforts to support gender inclusion are not accompanied by efforts at the interpersonal and individual levels, men may be less motivated to change or control negative attitudes and stereotypes towards women, leading to more cross-gender conflict.

Impact of Policies and Practices

Across a series of studies, we have tested the predictive effect of organisational signals of inclusion on women's experiences of social identity threat in STEM (Hall et al., 2018). In one study, we sampled 258 engineering undergraduate students (152 women and 106 men). Participants watched a video about institutional policies and practices, as well as gender representation, at a fictitious engineering company called CCB. The video showed a checklist with seven policies and practices present at CCB and four that were absent. This list always contained six gender-inclusive policies (e.g., "Programs and workshops to create cultural norms for positive working relations between genders") and five unrelated others. Depending on participants' randomly assigned condition, CCB was described as having either a high number (five) or low number (two) of these gender-inclusive policies, with the rest of the present policies unrelated to gender inclusion. The spread between the high and low gender-inclusive conditions (five versus two) corresponded to one standard deviation above and below the mean of perceived presence of these same policies rated by a different sample of professional engineers. Within each condition, we also varied whether this company was gender balanced or majority male.

As predicted, women reported lower levels of social identity threat when they imagined working for a company with either a high number of gender-inclusive policies and practices or a higher percentage of women (see Figure 2). Additionally, the presence of more gender-inclusive policies led women to anticipate having more accepting and respectful interpersonal interactions with colleagues, whereas representation of women had no such effect (see Figure 3). Neither cue consistently affected men's anticipated experiences.

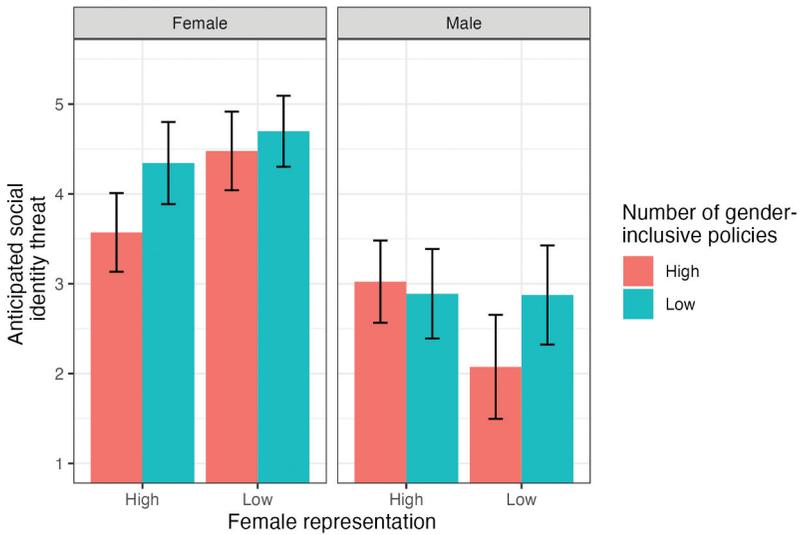


Figure 2. Mean anticipated social identity threat by participant gender and experimental condition. Note. Data come from Hall et al. (2018, Study 1). Error bars represent 95% confidence intervals.

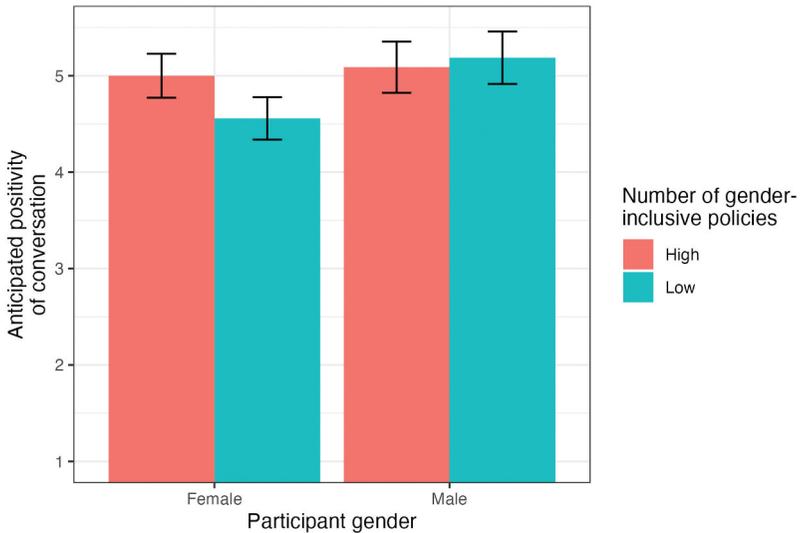


Figure 3. Mean anticipated positivity of conversations by participant gender and number of Gender-Inclusive policies. Note. Data come from Hall et al. (2018, Study 1). Error bars represent 95% confidence intervals.

This study relied upon an imagined workplace scenario, so it cannot address whether the perceived presence of these policies actually predicts women's experiences. To address this limitation, a series of field studies measured naturalistic variation in institutional signals of inclusion in engineering companies to examine their link with women's daily experiences in STEM. Across two studies, 269 professional engineers (148 women and 121 men) completed cross-sectional surveys and ten days of daily diary surveys. In the cross-sectional surveys, participants completed a checklist of gender-inclusive workplace policies and practices in their organisation, including items like "Does your organization have physical working conditions (equipment, clothing, shower, and toilet facilities) appropriate for men and women?" (see Table 1).¹ Participants also completed ten daily diary measures in which they reported their day-to-day experiences of social identity threat and interpersonal interactions with colleagues.

In these field studies, women who reported working in organisations with more gender-inclusive policies and practices experienced lower levels of daily social identity threat at work (Study 1: $r = -.29$, $p < .01$; Study 2: $r = -.16$, $p < .01$). Furthermore, women who indicated they worked in organisations with more gender-inclusive policies and practices also had workplace interactions that felt more accepting (Study 1: $r = .34$, $p < .001$; Study 2: $r = .16$, $p < .01$). Notably, this link between gender-inclusive policies and lower social identity threat was mediated by women reporting more positive, supportive daily conversations with male colleagues. Representation of women in their organisation did not predict these outcomes, which were unique to women's, and not men's, experiences. These findings were also robust to controlling for stigma consciousness and measures of dispositional positivity (i.e., emotional stability, life satisfaction, and dispositional happiness). This latter result suggests that the effects did not merely reflect individual differences in how women construed workplace experiences, but captured aspects of the culture as filtered through their interactions with male colleagues.

This series of studies suggests that gender-inclusive policies and practices may provide a broad system of inclusive norms that could shape how people interact with one another – specifically, women's felt acceptance from male colleagues. These findings align with our sociocultural approach to inclusion and suggest that institutional signals inform interpersonal relationships and individual experiences. Furthermore, such evidence has practical policy-setting implications for companies: Establishing inclusive organisational

¹In Study 2, we made efforts to validate employees' policy ratings by collecting the same checklist of gender-inclusive policies and practices from an organisation's HR officer. We were able to get HR reports for about 2/3 of the participants in Study 2. HR reports of gender-inclusive policies and practices were significantly correlated with employees' reports ($r = .56$, $p = .007$), suggesting that participants' ratings have some objective validity.

Table 1. Items assessing gender-inclusive policies and practices.

Policy type ^a	Item
Flexible Work Programs	<ul style="list-style-type: none"> ● My company has Flexitime policies (i.e., work scheduling flexibility around the start and end times of the work day, though a certain number of hours per day must be worked). ● My company has compressed work-week policies (i.e., full-time hours are worked in fewer than five days). ● My company has telecommuting policies/practices (i.e., allowing employees to working from home and communicate with the workplace through technology, occasionally or full time).
Work-Life Balance Programs	<ul style="list-style-type: none"> ● My company has on-site childcare. ● My company has a fund from which employees can draw to pay for various costs such as child or family care. ● My company has paid parental leave (i.e., over and above basic entitlements). ● My company has paid maternity leave (i.e., over and above basic entitlements).
Promoting a Gender-Inclusive Culture	<ul style="list-style-type: none"> ● My company has cultural norms and values that support positive working relations between men and women. ● My company conducts diversity awareness training. ● My company has recruitment and business advertisements that showcase gender diversity (i.e., are there images of both men and women, and people of different ethnicities)? ● My company has physical working conditions (equipment, clothing, shower, and toilet facilities) appropriate for men and women. ● My company has a formal workplace harassment policy. ● At my company, all employees receive training on the workplace harassment policy.
Recruitment, Retention, and Advancement in Engineering	<ul style="list-style-type: none"> ● My company offers training programs and activities to both men and women that provide equal opportunity for career advancement. ● My company offers career planning programs to retain and promote women as well as men in the organisation. ● My company offers mentorship programs that give equal and unbiased access to female and male engineers. ● My company conducts benchmarking surveys to measure whether people feel that they are promoted based on merit.

Items Assessing Gender-inclusive Policies and Practices

Note. Used in Hall et al. (2018). ^a Items were presented to participants grouped by type (e.g., Flexible Work Programs, Work-Life Balance Programs, etc.). The items from the groupings Flexible Work Programs; Work-Life Balance Programs; Promoting a Gender-Inclusive Culture; and Recruitment, Retention, and Advancement in Engineering were combined to form a composite measure of gender-inclusive policies and practices.

policies has the potential to reduce social identity threat, even in majority-male organisations (Hall et al., 2018).

Support for inclusive policies

Aside from enacting gender-inclusive policies and practices, companies can also work to create a culture where leaders and employees alike express support for these policies and practices. We explored the importance of support for institutional efforts for gender inclusion in a longitudinal field study of 181 professional engineers (96 women and 85 men) working in companies across Canada (Hall et al., 2021). Their perceptions of support within their organisation for gender-inclusive policies and practices were

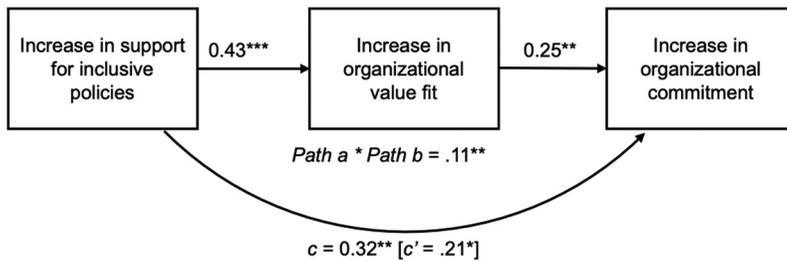


Figure 4. Indirect effect of increased policy support on increases in women's commitment via increased value fit. Note. Data come from Hall et al. (2021). Reported coefficients are standardised betas. * $p < .05$. ** $p < .01$. *** $p < .001$.

collected at two timepoints across a six-month period. Linear regressions were used to assess perceived change over time. Specifically, we residualized our focal variables by regressing scores at the six-month follow-up from earlier assessments of the same variables. We then examined whether an increase in perceived support for institutional efforts for gender inclusion (i.e., company policies and practices) would predict women's greater organisational commitment and value fit, both key predictors of employee turnover (Tett & Meyer, 1993).

As hypothesised, perceptions of stronger support for gender-inclusive policies and practices predicted greater organisational commitment among women, but not men. This relationship was mediated by women reporting an increased sense of fit between themselves and the values of the organisation (see Figure 4). These findings demonstrate a key link between the organisational culture in STEM and women's fit and commitment at work. Gender-inclusive institutional policies and practices may fail to support and retain women in STEM when most employees hold (or are thought to hold) negative attitudes towards those policies. STEM employees can support women's retention in STEM fields by signalling their own positive attitudes towards inclusive policies and practices. Taken together, our program of work suggests that institutions must not only put gender-inclusive policies and practices in place, but also work to create a culture where employees actively express support for these policies and practices.

Interpersonal features of inclusion

Institutional cultures can foster a sense of inclusion (or devaluation) directly via organisational signals conveying fit, but as our research has revealed, such messages are often indirectly filtered through interpersonal interactions. Thus, to fully benefit from diverse participation, organisations should foster ways for people to successfully develop, share, and synthesise inclusion-

boosting practices. Cultivating positive interactions within diverse groups is linked to increased creativity and innovation (Phillips et al., 2014), as well as generally opening people up to different ways of thinking (Hodson et al., 2018). Increasing collaborative interactions will allow people to enjoy more professional success and personal well-being, along with increased financial prosperity at the company level (Grant, 2007).

Benefits of positive interactions

Interpersonal interactions can satisfy important psychological needs (see Baumeister & Leary, 1995). In organisational settings, people who report experiencing positive workplace interactions report lower turnover intentions (Barling & Phillips, 1993), take fewer sick days (Barling & Phillips, 1993), and indicate lower levels of psychological distress (Cortina, 2008). Positive workplace interactions carry benefits not only for well-being, but also for behaviour. In workplaces with high levels of positive interactions, people engage in more prosocial behaviour (Bettencourt & Brown, 1997) and information exchange (Nahapiet & Ghoshal, 1998). Such interactions help with the formation of social support and mentor networks (Higgins & Kram, 2001) that predict job success (Eddleston et al., 2004). In sum, a large body of research points to the value of positive conversations at work.

STEM workplaces are highly collaborative, with teams working together to develop, design, implement, and troubleshoot projects. Conversations with other employees are where ideas and abilities are critically evaluated, and these interactions can also include subtle or not-so-subtle reminders of devaluation for those who are marginalised in that setting (Koudenburg et al., 2020; Murphy & Reeves, 2019; Steele et al., 2002). Thus, in STEM environments, interactions with colleagues are not only especially critical for employees' well-being and success at work, they are likely to be a key place where one's sense of inclusion and identity safety is felt.

Perils of Cross-group interactions

Numerous challenges can impede interactions between individuals from different groups. Even before cross-group interactions start, individuals' expectations of those from salient outgroups are often unduly negative. When anticipating an interaction with someone whose race, sexual orientation, or weight is different from one's own (as opposed to the same), people predict a more awkward and less effective conversation, even though these negative expectations are rarely borne out by actual cross-group interactions (Mallett et al., 2008).

Unfortunately, intergroup anxiety can lead people to avoid cross-group interactions altogether (e.g., by literally not showing up, Plant & Devine, 2003), limiting people's opportunities to correct their misperceptions and perpetuating homogeneous social networks. Moreover, when cross-group

interactions do occur, concerns related to how one is seen by others can undermine interactions for members of both advantaged and marginalised groups (Vorauer, 2013). Fears of appearing prejudiced or being the target of bias can foster misaligned interaction goals (Bergsieker et al., 2010), worsen performance on cognitive tasks (Richeson & Trawalter, 2005; Salvatore & Shelton, 2007), and trigger negative emotions (Shelton et al., 2005). When individuals harbour negative attitudes towards members of another group, they are more likely to avoid physical contact (Goff et al., 2008) and exhibit unfriendly nonverbal behaviour (Dovidio et al., 2002). Finally, effortful regulation of one's behaviour to counteract concerns about enacting or receiving prejudiced treatment can prove exhausting and yield divergent interaction outcomes for members of advantaged versus marginalised groups (see Shelton & Richeson, 2006).

Social identity threat

Experiences of social identity threat may also arise in cross-group conversations as people often draw upon relevant social categories to effectively navigate interactions (Goffman, 1959; Shelton & Richeson, 2006), especially in the beginning or when disagreements arise (Kunda et al., 2002). In STEM settings, social identity threat may be especially common due to negative gender stereotypes prevalent in the field (Seron et al., 2016) and women's underrepresentation, which makes gender a salient interpretative lens (e.g., Murphy et al., 2007).

Interpersonal cues to social identity threat are often distinct and more subtle than other explicit gender-based harassment and discrimination. Considerable work documents the explicitly hostile treatment of women in the workplace, including social undermining, sexism, incivility, and bullying (for a review, see Berdahl, 2007). Explicitly hostile gender-based discrimination arises from intentions to degrade women's status at work (Berdahl, 2007). In contrast to experiences of explicit sexism, social identity threat is a more subtle experience of feeling concerned about being seen through the lens of a devalued group identity (Steele et al., 2002). Thus, social identity threat is typically the product of subtle cues that make women aware of how they might be perceived on the basis of their gender (Murphy & Taylor, 2012). Our work has sought to identify the causes and consequences of these more subtle experiences of social identity threat in workplace interactions.

Experiencing threat in Cross-gender interactions

Social identity threat can undermine performance during cognitively demanding interpersonal interactions. Although studied extensively as underperformance on ability tests (i.e., stereotype threat), such threats are experienced more broadly during evaluative interactions (Richeson & Shelton, 2012). For example, women often perform worse than men in cross-

gender negotiations, a difference partially explained by subtle cues of gender stereotypes that can elicit stereotype threat (Kray et al., 2001). In addition, women tend to be less influential in conversations than men, speaking less frequently and using more tentative language (Carli, 1990; Dasgupta et al., 2015). Finally, women reap fewer benefits from their workplace conversations, perhaps because their social networks are smaller (Ibarra & Andrews, 1993) and less associated with workplace success (Eddleston et al., 2004).

The above examples are consistent with the idea that women experience worse outcomes in STEM partly as a function of threat elicited during their cross-gender interactions. However, alternative explanations could attribute these findings to women lacking skills (to negotiate), self-confidence (to be assertive in conversation), or resources (to exchange in networks). Some of the best evidence that interpersonal interactions can cue women's experience of social identity threat, with negative consequences for women's outcomes, comes from a compelling series of lab experiments finding that female engineering students performed worse on an engineering test after having to work with a male peer who held implicit sexist beliefs (Logel et al., 2009). Follow-up coding of nonverbal behaviour and experiments manipulating these cues identified that a more dominant and flirtatious posture by their male partner triggered women's threat-based performance decrements. These dominant non-verbal behaviours were more likely in men high in implicit gender bias. This finding is consistent with other work showing that women's performance during job interviews (Latu et al., 2015) and negotiations (Pardal et al., 2020) is predicted by their male interaction partners' levels of implicit gender bias.

A related field study sampled workplace conversations from male and female STEM faculty using a device that intermittently recorded snippets of sound as scientists went about their workdays (Holleran et al., 2011). These conversational snippets revealed that the more men's conversations with their male colleagues were about research topics, the more engaged men reported being with their work. For women, however, the more their conversations with male colleagues were about research, the less engaged they felt with their work. Further, only when talking about research with men were women later rated by coders as sounding less competent than men discussing research with other men. No such pattern emerged in interactions with female colleagues or about non-work-related issues. These findings align with other evidence that professional women experience greater social identity threat when they self-report comparing themselves to male colleagues (vs. women; (Hippel et al., 2011).

Tracking threat in interactions

We designed a set of field studies to clarify the triggers and consequences of women's experiences of social identity threat in STEM workplaces. These studies directly measured daily social identity threat for women as compared

with men working in STEM jobs. We hypothesised that women's experiences of social identity threat in these contexts would be predicted by their conversations with male colleagues specifically. We reasoned that these conversations, especially when they elicit negative self-perceptions, can lead to group-based categorisation processes that underlie social identity threat (Steele et al., 2002). Conversations with other women (even those that elicit negative self-perceptions) are less likely to engage group-based categorisation processes and be interpreted as possibly confirming negative gender stereotypes. Notably, we did not expect that conversations with men would indiscriminately trigger identity threat. Identity threat is felt most readily when someone perceives that they run the risk of confirming a negative stereotype or detects subtle devaluation of their group identity. Thus, conversations with male colleagues that lead women to question their belonging (Walton & Carr, 2012) or competence (Steele et al., 2002) may be particularly likely to elicit identity threat. Conversely, interactions that cue acceptance and affirm competence should minimise experiences of social identity threat (Abrams et al., 2008).

Using a within-person paradigm to document daily experiences, we theorised that interactions with men in STEM that subtly signal a lack of acceptance and respect would elicit social identity threat for women (Hall et al., 2019, 2015). We worked with engineering companies and graduate programs to recruit professional engineers and graduate students in engineering, physics, and computer science, sampling 485 participants (264 women and 221 men) across three distinct longitudinal samples. In each study, participants were asked to complete daily diary surveys for 10 workdays. Each day, they reported their experiences of social identity threat, workplace burnout, and interpersonal interactions at work. For these interactions, participants rated how accepted and respected they felt during the most significant conversations they had with work colleagues each day, as well as the gender and relative status of their conversation partner and the conversation topic (work or social).

In all three studies, women in STEM reported higher daily levels of social identity threat than did men (average effect across the three studies: $d = -.49$, $p < .001$). Women also reported more daily awareness of their gender and greater concerns about being judged based on their gender. Consistent with the capacity deficit model of identity threat (e.g., Schmader et al., 2008), women's daily experience of identity threat covaried with their daily fluctuations in psychological burnout at work (average effect: $r = .30$, $p < .001$; see Figure 5). On days when women felt higher levels of social identity threat, they also reported being more emotionally exhausted and burned out by their job. Awareness of gender was unrelated to men's daily burnout (average effect: $r = .05$, $p = .304$). As psychological burnout impedes workplace productivity and predicts attrition (Maslach et al., 2001), these findings provide critical insight into the possible antecedents of women's high attrition rates from these fields.

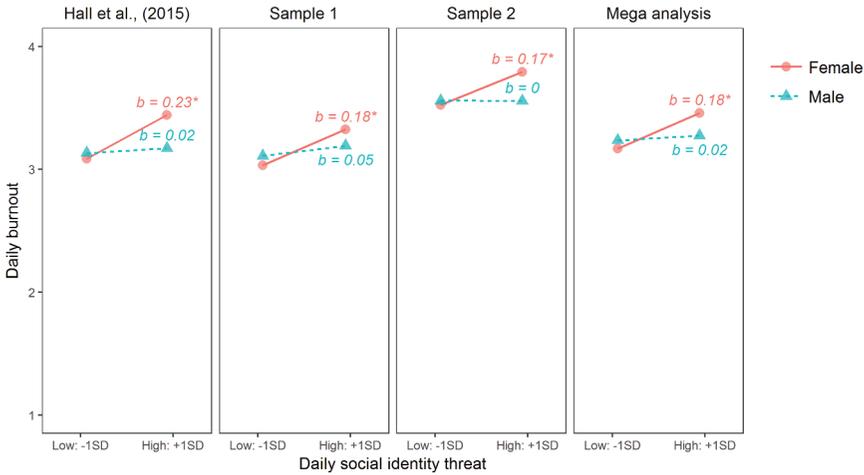


Figure 5. Simple slopes for daily social identity threat predicting daily burnout by participant gender. Note. Data from a mega-analysis across the samples collected in Hall et al. (2015) and Hall et al. (2019; Samples 1 & 2).

Critically, and as we had hypothesised, across the three different samples, women (but not men) also reported greater social identity threat on days when their conversations with male (but not female) colleagues cued a lack of acceptance and respect (average effect: $r = -.27, p < .001$; see Figure 6). Also, for women, the relationship between daily levels of social identity threat and

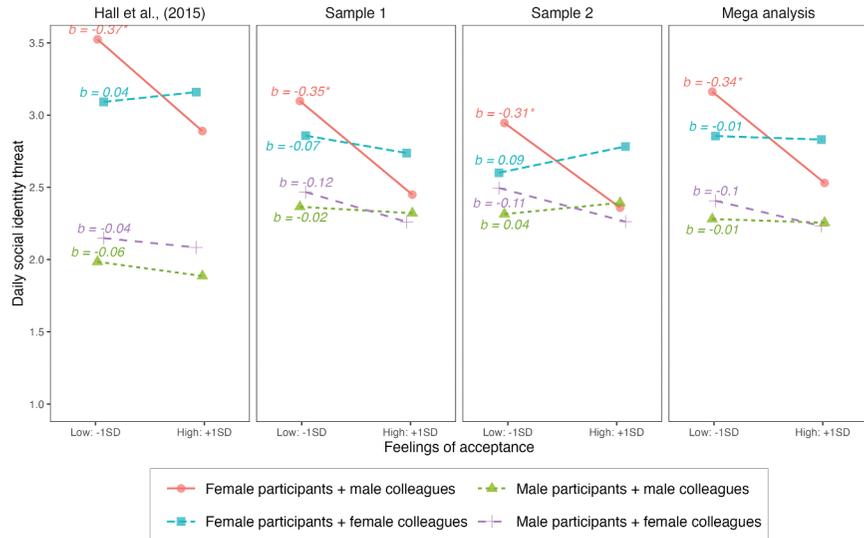


Figure 6. Simple slopes for conversational acceptance predicting daily social identity threat by participant and conversation partner gender. Note. Data from a mega-analysis across the samples collected in Hall et al. (2015) and Hall et al. (2019; Samples 1 & 2).

burnout was mediated by negative interpersonal experiences. In other words, women's day-to-day experiences of social identity threat and burnout depended upon the interpersonal context at work each day, but men's experience of social identity threat did not.

Alternate explanations

In Hall et al. (2019) we conducted a mega-analysis of our results. Pooling these 400+ participants from three samples (one from Hall et al., 2015, and two from, 2018) into a combined sample, we used mega-analytic techniques (Cooper & Patall, 2009) to explore boundary conditions and rule out alternative explanations. First, we tested whether conversation type (work vs. social) moderated our effects. Based on stereotype threat research, we hypothesised that work-related (vs. social) conversations would be more likely to elicit women's concerns about confirming negative stereotypes. Consistent with this hypothesis, we found that social conversations with male colleagues did not predict women's experience of social identity threat (even when those conversations were negative). Only conversations about work-related topics revealed these effects, consistent with our past work showing that the more women in STEM talk about research with their male colleagues, the more disengaged they report feeling from their work (Holleran et al., 2011).

We also tested an alternative explanation that hostile interpersonal experiences with men best explained women's daily experiences of social identity threat and burnout. Drawing on past research (Richeson & Shelton, 2012), we expected that subtle signals of a lack of acceptance and respect, more than overt acts of hostility, explained women's experiences of identity threat. Variation in participants' daily ratings of experienced hostility and condescension during interpersonal interactions with men (but not with women) significantly predicted identity threat for women. However, this effect for the presence of hostility was half the size of the effect observed using items focused on the absence of acceptance and respect. Moreover, excluding the <3% of conversations rated as high in hostility (above the scale midpoint) did not affect our results, suggesting that highly hostile interpersonal experiences do not drive these patterns. Rather, subtler cues of a lack of full acceptance during work-relevant conversations predict social identity threat and burnout for women in STEM. The chilly climate that many women report is often less about the frequent presence of negatively gender biased interactions with men at work, than the lack of truly positive and inclusive ones.

This program of research was among the first to establish social identity threat as a daily experience among women in STEM. Although the correlational nature of these field studies places obvious limits on causal claims, these findings align with a theoretical model whereby subtle cues of non-acceptance in cross-gender interactions elicit social identity threat for

women, with downstream consequences for burnout that could explain why some women exit STEM fields at higher rates. This work highlights the importance of positive interpersonal norms in establishing an inclusive workplace culture.

Individual features of inclusion

Our work, consistent with broader theorising about culture (Markus & Kitayama, 2010), suggests that a workplace's institutional features can reach into the minds of individuals and inform the way they perceive themselves and others. Attitudes and stereotypes that associate STEM more with men than with women have been documented for decades (see Charlesworth & Banaji, 2019a). Although the tendency to “think STEM, think men” has been weakening somewhat over time, these biases still exist at both the explicit and implicit level (Charlesworth & Banaji, 2019b). Distinct from explicit beliefs about women's abilities and interests, implicit stereotypes are more automatic, less conscious, and less controllable (Greenwald & Banaji, 2017). Implicit attitudes and stereotypes held by men and women in STEM workplaces contribute to constructing the organisational culture.

Internalising Implicit Bias

Implicit associations are learned from what is accessible in our immediate cultural context (Payne et al., 2017). When the dominant culture signals that your group is devalued, people can come to develop negative associations about themselves and their group (Baron et al., 2014). For instance, the implicit association of “science” (vs. “arts”) with “male” (vs. “female”) is stronger in countries with fewer women majoring in science (Miller et al., 2015).

Given the mind's inherent drive for consistency, these learned stereotypes – when combined with an implicit association of oneself as a member of the stereotyped group – can then shape the likelihood that the domain does (not) become associated with the self (Cvencek et al., 2021; Nosek et al., 2007). For women in STEM, negative implicit associations about quantitative abilities predict several career-important outcomes such as perceived self-efficacy and actual performance on STEM relevant tasks (Asgari et al., 2010; Baron et al., 2014; Block et al., 2018; Nosek et al., 2009). Retraining these associations can also improve women's STEM self-concepts, performance, and interest in STEM (Forbes & Schmader, 2010).

Implicit stereotypes and attitudes have the potential to limit not only representation of women but also women's experiences of inclusion in STEM. In one study, we used field data, collected at two timepoints, one month apart, to test how internalised negative implicit stereotypes related to women's organisational outcomes. We surveyed 263 engineers (145 women and 118 men) from 27 Canadian and American

companies² (Block et al., 2018). A Brief Implicit Association Task (BIAT; Sriram & Greenwald, 2009) measured their automatically activated cognitive associations between gender (male and female names) and engineering (as compared with family) words. One month later, participants reported their organisational commitment, a construct linked to workplace turnover (Tett & Meyer, 1993). Women (but not men) with strong Engineering = Male associations reported lower organisational commitment (see Figure 7). Self-concept fit and self-efficacy (also measured one month later) mediated this relationship. Analyses ruled out the possibility that explicit associations or organisational features (e.g., representation of women) explained the observed relationship between women's implicit associations and organisational commitment. This work suggests that even women with successful careers in STEM still sometimes internalise negative cultural stereotypes that are linked to their self-beliefs.

Implicit Bias and Inclusion in Teams

Holding negative gender stereotypes and attitudes may not only undercut women's sense of efficacy in STEM, but these stereotypes might also make men less likely to see women as valuable contacts within the organisation or

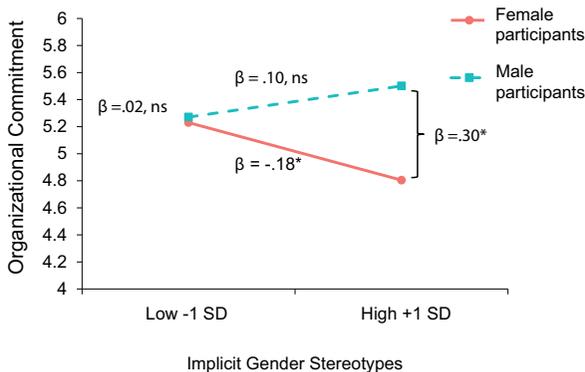


Figure 7. Implicit associations and participant gender predicting later organizational commitment. Note. Data come from Block et al. (2018). Organizational commitment was measured on average one month later. Higher scores on the x-axis indicate participants' stronger implicit associations of male (vs. female) names with engineering (vs. family) words

²A multilevel modelling analysis of company-level variability in the outcome variables suggested that there was no significant between- or within-company variation in the primary outcome variable, organisational commitment (between: $\sigma^2 = 1.56$, $p > .05$, within: $\rho = 1.83 \times 10^{-16}$, $p > .05$). The lack of evidence of company-level dependencies in the data meant that the focal analyses reported in Block et al. (2018) did not employ multilevel modelling.

to fully include women in their networks. In one study, we measured implicit stereotypes (using a gender-STEM BIAT, described previously), social network metrics of inclusion, and workplace outcomes (e.g., fit, organisational commitment) from 1,247 STEM professionals (385 women and 862 men) working at nine organisations (Cyr et al., 2021). To capture social network structures, each participant listed five teammates, then indicated who (including themselves) sought out each other person for informal socialising (e.g., chatting during breaks) and who respected whom as competent. We then separately computed each participant's proportion of outbound ties (i.e., from themselves towards teammates) and inbound ties (i.e., from teammates towards participants), distinguishing between ties involving same- or different-gender teammates.

As predicted, men with stronger implicit gender stereotypes socially included fewer female teammates ($d = 0.17$, $p = .022$); however, respect for female teammates was not related to men's implicit stereotypes ($d = 0.10$, $p = .194$). This lack of social inclusion by male colleagues at work was then related to worse career fit and engagement for women ($ds \geq 0.24$, $ps < .001$), mediated by reduced social fit; in contrast, cross-gender social inclusion was not uniquely linked to men's outcomes ($ps > .133$). This correlational study suggests the potential impact of implicit stereotyping in the workplace: Implicit stereotyping may subtly alter informal social ties in the workplace, shaping women's sense of social fit and resultant workplace experiences. It also emphasises the importance of interpersonal social connections in the workplace, over and above respect for co-workers' competence. Finally, these findings highlight that gender biases can reveal themselves in the absence of social connection, not only the presence of negative outcomes and interactions.

Expressing or combatting implicit bias

Implicit gender biases may be prevalent but holding them does not necessarily lead to the expression of discriminatory behaviour towards women in STEM. Rather, the expression of these biases will be shaped by the cultural context (Payne et al., 2017) and individual beliefs and motivations (Forbes et al., 2012). The surrounding workplace context (i.e., norms communicated by institutional policies and interpersonal experiences) can either licence individuals to act on these biases or encourage an employee to suppress or work against them (Crandall & Eshleman, 2003).

Research from our program of work suggests that denying that bias exists may actually facilitate its expression (Régner et al., 2019). In a field study of actual committees tasked with selecting individuals for elite scientific research positions, committee members completed measures of their implicit Science = Male stereotypes and their explicit beliefs about gender disparities in science. Over one year, the rate at which participants promoted women

into elite research positions was tracked. Analyses showed no indication that implicit Science = Male associations at the committee level predicted overall tendencies to promote women. Instead, aggregated implicit associations were negatively associated with hiring women the following year only when committee members doubted that women in STEM face external barriers (e.g., discrimination) to their success. In sum, when a group converged on denying the existence of gender gaps in STEM, committees with stronger aggregate gender stereotypes were less likely to select women for the positions. Importantly, these findings were independent of the proportion of women on the selection committee.

In sum, internalised individual biases are linked to one's experiences of inclusion, but also have the potential to shape the interpersonal and institutional features of a setting. In turn, organisational policies and practices and individuals' interpersonal experiences influence expectations and stereotypes for both perceivers and targets of bias.

Summary

In the summarised research, we have proposed that identity-based inclusion is collectively constructed from individual biases, interpersonal experiences, and institutional signals. By moving beyond a narrow focus on either individual biases or structural disadvantages, this framework offers a more complete approach to understanding how inclusion is both cued and experienced within a broader cultural context. This program of work also addresses recent calls for a deeper examination of social identity threat's replicability (Zigerell, 2017) and impact outside of the lab (Aronson & Dee, 2012; Casad et al., 2016; Kalokerinos et al., 2014). It also provides practical insights into when and why organisational approaches to inclusion will fail or succeed. Each level of our model offers a point of intervention for creating a more inclusive environment for women and men in STEM. In the remaining section of the paper, we will outline several actionable suggestions for creating inclusive work cultures in STEM based on a sociocultural and social network understanding of inclusion in organisations.

Actionable insights for creating inclusive work cultures

Systemic bias is best understood (and dismantled) by examining the ways in which bias exists and is reinforced across these different levels of culture. Inclusion initiatives risk failing if they seek change at only one level, lacking an understanding of how bias is perpetuated and reinforced through multiple systems (Lewin & Frontiers in Group Dynamics: II, 1947; Walton & Yeager, 2020). To create inclusive cultures, organisations should consider how their initiatives can foster change at these three distinct but interrelated

levels. For example, attempts to de-bias perceivers (e.g., Chang et al., 2019) do little to promote holistic inclusion unless paired with broader institutional norms of respectful interpersonal dynamics (e.g., valuing different viewpoints, encouraging collaboration) and inclusive institutional signals (e.g., inclusive policies and practices). Much like Lewin's and Frontiers in Group Dynamics: II (1947) proposal that an understanding of channel factors and interacting forces matters for behaviour change, we argue that creating inclusive spaces requires an understanding of the sociocultural forces within an organisation.

Organizations play a central role in creating inclusive workplace norms, but the degree to which norms are adopted depends upon individuals' abilities to recognise, represent, and recall cultural information (Chudek & Henrich, 2011). Social psychology has a long history of studying norms (e.g., Asch & Guetzkow, 1951; Bandura & McClelland, 1977; Festinger et al., 1950; Sherif, 1936), and more recently, cultural-evolutionary psychologists have synthesised much of this work, describing how the human capacity for social learning determines the cultural norms an individual will adopt and thus perpetuate (Chudek & Henrich, 2011).

Organizations can more effectively establish inclusive cultures if they attend to factors known to facilitate norm transmission. Workplaces looking to communicate and spread norms of inclusion should carefully craft content to directly introduce employees to the notion of inclusion and simultaneously encourage people to model inclusion at work. Consistent with the different levels of our theoretical model, we suggest that inclusive cultures may be established and facilitated through multiple channels: (a) organisation-to-employee communication (top-down transmission), (b) employee-to-employee communication (community transmission), and (c) employee-to-organisation communication (grassroots transmission). At each of these levels, insights from norms psychology can be leveraged to facilitate the spread of norms to establish more inclusive work cultures. Our tri-level framework suggests several actionable strategies (described in Table 2) that could be adopted by an organisation looking to create and maintain an inclusive organisational culture. We do not claim to present an exhaustive list, but instead to show how our theoretical approach can translate into practical action items for workplaces.

Top-down transmission (Organization to person)

Top-down transmission refers to the transfer of cultural information from the institution to individual employees. Such information could include messages of inclusion in a company website, recruitment materials, policy handbooks, company sponsored workshops, or the like. Although we know that signals of inclusion from an organisation can mitigate concerns about

Table 2. A partial list of practical advice for translating our theoretical approach into action.

Top-down transmission

- Organizations should select **prestigious, articulate, and well-liked members** to communicate messages of inclusion. Organizations could A/B test messages from different communicators for perceived trust and likeability, key factors in persuasion.
- Organizational materials about inclusion should be **memorable**. Values and policies should not be buried in guides or handbooks. Short, salient, specific, and self-relevant messaging in an infographic about how exactly the organisation meaningfully promotes inclusion will be more easily remembered and spread.
- Workplaces should make materials about inclusion **easy to share** and endorse. For instance, resources and images should be small in file size or easily linked online. Employees could also receive inclusive posters or stickers for their office space.
- Critically, organisations must track perceptions and effectiveness of these efforts for fostering inclusive relationships via **clear metrics** for equity, diversity, and inclusion.

Community transmission

- Learning by observing others is among the most effective ways to acquire cultural information. Organizations should leverage **social learning** when designing diversity and inclusion training, for instance, by employees observing examples of interpersonal inclusion (e.g., how to engage in allyship actions deemed effective by recipients).
- Network science can facilitate efficient spreading of inclusive norms. Organizations can **identify influencers** to model and spread such norms. This approach could also help identify and reach out to more insular groups of employees.
- **Participative discussion groups** (for example, Wu & Paluck, 2020) can build employee consensus and feelings of autonomy about inclusion initiatives.
- Messaging should focus not only on minimising and confronting negative interpersonal behaviours, but also on **proactively creating** experiences of inclusion.

Grassroots transmission

- Collective action will be more successful when leveraging identity motives. Organisers should foster a strong sense of **collective identity** within their movement. For example, they might highlight a superordinate identity (e.g., engineers) of potential supporters, while also acknowledging the value of different perspectives within that coalition.
- Organisers should highlight that **change is possible** at all levels. Organisers could point to other organisations that have successfully created a more inclusive culture.
- Creating **safe spaces** enables employees to share their identity-relevant experiences. Making injustice salient should facilitate efforts to question and change the status quo.

Sustaining inclusive norms

- Organizations should highlight institutional, interpersonal, and individual instances of inclusion. Newsletters can regularly **feature successes** of inclusion initiatives. **Awards** can celebrate employees who embody the inclusive values of the organisation.
 - Organizations could include inclusion as a metric for **employee evaluation**. For example, managers' performance evaluations could include a discussion of their efforts to attract, support, and promote marginalised groups within the organisation.
 - Data collected from employees about their perception of the organisations' culture should be made available via **dashboards** viewable by anyone in the organisation.
-

stereotyping and prejudice for those who might be targeted by bias (see Murphy et al., 2007), less is known about how these signals could be used to shape and instil norms. When crafting organisational messaging around inclusion, organisations must consider that their messaging may be met with reactance and resentment from some employees (Morrison et al., 2010). For instance, institutional messages encouraging inclusive gender norms may directly oppose traditional stereotypes that some employees endorse, resulting in messages being discounted or ignored. Careful consideration of how an institution frames messaging may increase employees'

support for inclusion initiatives (for empirical example, see Farrell et al., 2021). Insights from norms psychology may provide clues as to how company messaging could be crafted to minimise reactance and effectively spread and establish norms that influence behaviour.

Persuasive messaging

Cultural information will be adopted at higher rates when seen as credible (Newson et al., 2007). The credibility of institutional efforts for gender inclusion plays a critical role in mitigating resistance and backlash to these initiatives (Flood et al., 2021). Organizations should consider apparent credibility when deciding on representatives who will deliver cultural information about inclusion. Top-down delivery of inclusion messaging could be enhanced by using prestigious (Chudek et al., 2012; Paluck et al., 2016) and articulate communicators (Petty & Cacioppo, 1986) who are seen positively in the organisation (Chaiken, 1980). Similarity cues (e.g., a common group identity) may additionally facilitate the adoption of a social norm (Haslam et al., 2015). Evoking a group identity shared by the messenger and audience (e.g., engineers) may also enhance credibility and reduce the potential for backlash (Haslam & Reicher, 2007). Credibility could also be increased when messaging describes inclusion initiatives as internally desired by the organisation rather than imposed because of external pressure (Farrell et al., 2021). Finally, source legitimacy is perceived to be higher when someone argues against their own self-interest (Petty & Cacioppo, 1996; Walster et al., 1966), potentially making male advocates of gender inclusion effective norm spreaders (Hekman et al., 2016), especially among male employees. Taken together, carefully crafted organisational messages of inclusion will increase credibility, reduce backlash, and enhance adoption.

Message Dissemination

Once a message has been accepted, organisations should think about how to help it spread. Employees may resist spreading institutional messages of inclusion because the messages run counter to their personal beliefs and stereotypes. Messages perceived as counter attitudinal elicit negative emotion and tend to be discounted or ignored (Petty & Briñol, 2015). Organizations can consider the following features when crafting organisational content around inclusion. First, cultural information that is “sticky” (likely to persist in memory) is more likely to appear, become, and remain culturally normative (Conway & Schaller, 2007). From a cognitive perspective, memory is a core factor of norms transmission (Schaller et al., 2002). The more memorable a piece of cultural information, the more likely it is to be discussed and disseminated (Norenzayan et al., 2006), as well as liked (Greenwald, 1981). Making messaging distinctive (Belmore & Hubbard, 1987), aligned with

previous cultural knowledge (Snyder & Uranowitz, 1980), or “minimally counterintuitive” (i.e., somewhat – but not entirely – inconsistent with prior expectations; Atran & Norenzayan, 2004) facilitates memorability, communicability, and thus norm transmission (Rimé et al., 1991).

Taken together, organisations can capitalise on learning biases and norms psychology to facilitate the acceptance and adoption of inclusive cultural norms. Considering how and by whom cultural information is presented can facilitate the reception and spread of inclusive norms. Facilitating employee conversations around institutional signals of inclusion represents a key initial step for spreading norms of inclusion through community transmission.

Community transmission (Person to person)

Community transmission refers to cultural norms communicated between employees, typically through their words or actions. Social learning (i.e., learning by observing others) is theorised to be the primary and most effective means to acquire cultural information (see Bandura & McClelland, 1977; Henrich, 2009). Social interactions can spread norms that either support or undermine inclusion: For example, sexist norms are readily inferred from overheard conversations where a sexist remark does not disrupt the flow of conversation, although introducing even a brief pause following the remark (without an explicit challenge) reduces observers’ perceptions of sexist norms (Koudenburg et al., 2020). Within organisations, community transfer of company culture is markedly more sustainable than direct transmission because well-constructed messages will continue to be shared from person to person over time (Henrich, 2015). Inclusive interpersonal behaviours (e.g., Hall et al., 2019) and allyship behaviour – defined as effective actions by the advantaged group to promote inclusion (De Souza & Schmader, 2021) – provide clearer evidence of an organisational culture than “official” messages in mission statements and policy handbooks. Inclusive behaviour from employees themselves is harder to fake than policies and practices (Kroeper et al., 2020), and so this approach may help guard against inclusive policies becoming “window dressing” that can enable moral credentialing or denial of bias and discrimination (Dover et al., 2020; Kaiser et al., 2013).

Identifying and involving influencers

Norms psychology provides a playbook for organisations seeking to facilitate community transmission of inclusive norms. Organizations can focus direct transfer of norms onto individuals (or groups of individuals) who are most likely to spur a cascade of community transfer. Influential individuals who are highly regarded within dense social networks or who bridge across

disparate groups of employees could be identified using network science approaches. For example, individuals can be asked to nominate people within their organisation whom they respect or see as popular (e.g., Paluck & Shepherd, 2012) or spend the most time with (Paluck et al., 2016). Following work using directed snowball sampling (Kim et al., 2015), organisations could also find relatively more well-connected individuals by randomly sampling a subset of employees and asking them to nominate even just one person they trust or like (who will on average be more embedded in the network than the average employee).

For these approaches to be most effective, norm-initiators should be seen as prototypical of the organisation (Haslam et al., 2015), yet in high-status leadership roles (Dannals et al., 2020), and not acting due to external pressure (Asch & Guetzkow, 1951; Farrell et al., 2021). In many contexts, advantaged group members may be better positioned for effectively spreading inclusive organisational messaging, although well-networked members of marginalised groups might also be effective norm-initiators and sources of social support. Encouraging organisations to use social network positionality as a marker of who may be a particularly efficacious spreader of inclusion norms may have the added benefit of curbing the tendency to always seek out underrepresented individuals (e.g., women) to take up these causes. Finally, inviting the active collaboration of influencers on inclusion messaging can increase impact. In a large-scale field experiment, getting a subset of students to help develop anti-bullying messages and disseminate to peers reduced student conflict by 25%, an effect that strengthened when these norm-spreaders were students with influential network positions (Paluck et al., 2016, 2018).

To further facilitate community transfer, organisations can encourage consensus-building around inclusion. Research suggests that we choose to communicate information to build a shared social reality (Festinger et al., 1950; Pinel et al., 2006). Ideas spread better when people are motivated to pitch them, and others are (and are perceived as) open to receiving new information (Conway & Schaller, 2007). Organizations could facilitate consensus through structured conversations between employees about the value of gender inclusion. Creating consensus may reduce resistance from men (Flood et al., 2021) while also lessening women's concerns about their success being attributed to special treatment from their organisation (Ovseiko et al., 2017). If people see an idea as important and something that others want to hear, they are more likely to communicate it (e.g., Kopietz et al., 2010), increasing its chance of becoming culturally normative.

Channel factors

Organizations should examine the structure of their community for facilitating features (i.e., channel factors) or barriers to spreading inclusive

norms. Using a social contagion lens, physical and social network structures of employees that allow for less integrated communication (e.g., virtual workspaces, siloed departments) provide fewer potential avenues for community transfer of norms (Freedman et al., 1980). Further, features of the community hierarchy can also direct norm uptake, with greater contagion and buy-in for ideas conveyed between people in similar roles or levels (.g., intern to intern, rather than manager to intern; Burt & Janicik, 1996).

Organizations can actively engineer social structures that facilitate norms transmission, for example, through bounded clusters of individuals sharing in the uptake of the new norm. This approach can provide fertile grounds for norm persistence by boosting the local percentage of norm adherence (Kincaid, 2004), and offer an opportunity for gender diverse groups to show mutual respect and inclusion. Direct communication with informal employee clubs or committees supporting new inclusion norms can serve this function, as can encouraging and financially supporting people who want to form such communities. Behavioural nudges (He et al., 2022) can also be used to aid the formation and development of these communities. For instance, an inclusion-focused regular coffee hour could offer refreshments or reading materials to entice people to gather and discuss inclusion initiatives in the organisation.

As a norm-consistent behaviour becomes common in an organisation, employees' exposure to the norm will become more frequent. Frequently encountering something increases memory and liking for it (Pinter & Greenwald, 2004; Zajonc, 1968). Theoretical (Cialdini, 1993) and mathematical (Wu, 2019) models suggest that the more people communicate a norm, the more influential it is. People collectively reinforcing a norm are more effective than a lone actor. For example, women report feeling greater identity safety when they hear a sexist comment about female directors challenged by three people, rather than by only one person in the presence of two people who fail to speak up (Hildebrand et al., 2020). In sum, the more common inclusive behaviours become, the more they will be remembered, liked, and reproduced.

Challenges

Community transmission, while powerful, has several downsides. First, for a norm to be transmitted using social learning it must be modelled by someone in the organisation. Targets of bias who speak out against prejudice run the risk of being seen as troublemakers (Kaiser & Miller, 2001). Although members of advantaged (vs. disadvantaged) groups experience fewer costs when they model inclusion (Hekman et al., 2016), social norms can still inhibit them from taking allyship action (De Souza & Schmader, 2021). Modelling inclusive behaviours can be costly in other ways. For example, an employee who uses paid parental leave may help normalise the practice

for other people but may still personally experience some stigma for taking time away from work. Second, messaging about inclusion can morph and change as it is communicated between people (Muthukrishna et al., 2014). Pockets of resistance may form as a product of inclusion initiatives being poorly communicated by the organisation or employees. When people believe certain biases are widely shared, justified, or not applicable to them, they may feel morally licenced to engage in bias (Crandall & Eshleman, 2003). For example, third-party prejudice may occur where people enact biases that they believe others in positions of power hold and would support, even if they personally do not (Vial et al., 2018). To guard against these challenges, organisations should consider putting initiatives in place to not only initiate but also sustain inclusive norms (see Section 3.4).

Grassroots transmission (Employee to organization)

Grassroots movements in organisations are efforts by employees to rise and challenge the status quo (and often those in power). When organisational structures or practices are unjust, people are often motivated to seek change through collective action (Drury et al., 2019; Wright et al., 1990). This change requires collective movement towards a shared goal. Through organised efforts, collective resistance can emerge in which people express solidarity, collective efficacy, and coordinated action in response to organisational or interpersonal factors that undermine inclusion (Alfadhli et al., 2019). Collective employee organising in STEM companies is one potential route to change a work culture and establish norms of inclusion and respect. For example, in November 2018, around 20,000 Google employees at multiple offices carried out an organised walkout expressing demands about sexual harassment and Google's approach to EDI (Wakabayashi et al., 2018). The walkouts led to arbitration, with Google committing to increased transparency around its handling of sexual harassment and catalysed the formation of a worker union (Conger, 2021).

Considering influence and identity

Theories of cultural change can also offer insights to organisers seeking to change the work culture in a STEM organisation from the ground up. For organisers, insights from norms psychology offer methods to overcome resistance from management or other employees arising in response to efforts to change the status quo. Using norms psychology may help reduce the burden on female organisers. A potential downside of grassroots movements in STEM workplaces is that women and members of other marginalised may take on most of the organising efforts, hindering their career advancement. Organisers, like organisations, should consider factors known to facilitate norm transmission and how they can leverage social learning

biases to garner support for their goals. For example, who shares a message and how it is communicated should be informed by the psychology of norms and persuasion (e.g., trustworthy, respected employees are more likely to be effective messengers for the collective movement). Actively recruiting and galvanising advantaged group members to carry out sustained allyship actions should help lessen the burden of organising efforts.

Identity motives contribute to the success of collective movements (Haslam et al., 2015). A movement's effectiveness can depend on organisers' ability to create a superordinate identity among potential supporters of their cause, including those who feel marginalised and their more advantaged allies (Haslam et al., 2015). A strong identification with a collective identity is associated with increased motivation and action towards the group's goals (for review, see Drury et al., 2019). Insights from social identity theory can foster group identification and encourage grassroots action in an organisation.

Uncovering injustice

Individuals more readily come together to question and change the status quo when they believe they have experienced (or witnessed) injustice (Campbell, 1958; Subašić et al., 2018). Thus, organisers should highlight the negative experiences of women and other marginalised groups in their workplace, pointing out a lack of balanced representation, making lived experiences of bias salient, or spotlighting the dearth of institutional efforts to enact inclusive policies. Pointing out the lived experience of bias might be especially important in an organisation where the institution is inauthentically signalling inclusion (Dover et al., 2020). Highlighting how apparent organisational efforts for inclusion are failing marginalised group members might help overcome the sedative effects of an ostensibly welcoming work culture on collective action (Wright & Lubensky, 2009). However, making injustice salient also can be emotionally taxing for those who regularly experience bias and discrimination (e.g., Gibbons et al., 2010). Thus, although marginalised individuals should be included in developing messages – to maximise their effectiveness and minimise the potential for harm – allies from advantaged groups must also be actively involved to help shoulder the burden.

People are more willing to work to alter aspects of a culture that they see as changeable (Tajfel & Turner, 1979; Van der Toorn et al., 2014). In experimental research, strengthening women's beliefs that people can change increases their likelihood of confronting a male colleague's sexism (Rattan & Dweck, 2010), and their subsequent impressions of him, as well as – indirectly – their workplace belonging and satisfaction (Rattan & Dweck, 2018). A core value in STEM fields is innovation and change (Rottmann et al., 2015). Tapping into this central value might offer a way to garner

support for change from others in a STEM workplace. Organisers should communicate that collective rather than individual action most effectively changes the system (Wright & Taylor, 1998). Articulating the type of culture the grassroots movement seeks to build also helps catalyse change (Haslam et al., 2015), for instance, by highlighting other workplaces that have successfully organised and changed their culture. Cognitive alternatives to the current organisational status quo will help highlight existing injustices and facilitate motivation and action (Subašić et al., 2012).

Finally, conveying the plight of workers to the outside world (e.g., via media releases) can garner material support and enhance perceived efficacy of collective action (Haslam et al., 2015). For example, during Google walk-outs, employees made use of social media to share their stories and their list of demands (Newton, 2018). More recently, Amazon factory workers and delivery drivers used similar tactics, sharing stories about the working conditions at Amazon in an effort to garner support for unionising (Vincent, 2021).

Sustaining inclusive norms

Once an inclusive norm emerges and spreads within an organisation, maintaining it still requires effort. Norms psychology offers several practical suggestions for how to do so effectively. The way the organisation reacts to employee behaviour that either does or does not live up to a company's stated inclusive work culture is also critical to sustaining inclusive norms.

Featuring Pro-inclusion behaviour

STEM organisations can highlight and publicly reward employees who behave inclusively. Featuring employees who support others who are demographically dissimilar to themselves may help counteract pervasive tendencies to derogate the competence of women and people of colour who exhibit diversity-valuing behaviours (Hekman et al., 2016). Doing this may help reduce the tendency to see inclusion efforts as self-interested or zero-sum (see Stevens et al., 2008). Highlighting others' norm-consistent behaviour change inspires individuals to follow those norms, as well (Sparkman & Walton, 2017). Communicating behaviour prevalence means focusing on employees' norm-consistent behaviours, rather than abstract company values. This approach can help organisations avoid empty values statements that are disconnected from organisational culture. In a workplace, spreading messages of inclusion can feed into community transfer: As perceptions of others' norm sharing increase in frequency, so too does one's likelihood of personally transmitting the norm (Bakshy et al., 2012).

Addressing norm violations

Highlighting inclusive norms is one method of norm maintenance, but organisations can also put in place means of minimising norm violations. First, organisational messaging that make known systems of accountability for living up to inclusive norms can help regulate behaviour. Norm regulation is most effective when groups highlight sanctions put in place in response to norm violations (Wilson et al., 2013), but avoid highlighting behaviour that runs contrary to inclusive values and norms, which can normalise and exacerbate bad behaviour (e.g., Cialdini, 2003). Accountability for inclusion is one of the most effective means of improving the success of diversity and inclusion programs (Kalev et al., 2006). Controlled lab experiments also point to accountability as a means of reducing stereotyping and prejudice (Tetlock & Mitchell, 2009). Finally, when employee actions fail to live up to inclusive values, organisations can highlight social disapproval of undesirable behaviour (Cialdini et al., 1991), which can only increase as norms take a stronger hold in the community. Highlighting the social disapproval rather than the norm violation can help avoid inadvertently spreading behaviour that does not fit with the organisation's inclusive values.

In sum, organisations can implement psychologically informed systems that leverage insights from norms psychology to collectively construct and sustain inclusive work cultures. Communications about norms can highlight pro-inclusion messages – featuring specific role models, norm-consistent behaviour change, and employees' widespread norm adoption – without narrowly typecasting marginalised individuals as diversity champions. Measures to address any pushback or violations should highlight social disapproval without “normalizing” bad behaviour.

Limitations and future directions

Intersectional Scholarship

Central to our approach is the idea that a person's identity within a workplace is partly constructed from their experiences with the organisational culture. This position owes a theoretical debt to intersectional approaches to psychology (Cole, 2009). Scholarship within the intersectional tradition argues that constructs like race and gender should be considered as constructed social processes rather than characteristics of individuals (Helms et al., 2005). An intersectional approach asks researchers to examine how systems shape identity (Cole, 2009; Crenshaw, 1991), which is entirely consistent with our position that interactions with the organisation's culture inform identity within the workplace. However, in an effort to make generalisable claims, our empirical and theoretical analysis has perhaps at times

flattened nuances that an intersectional approach would encourage us to consider.

An intersectional approach pushes for theoretical and empirical work reflecting the reality that a person can experience disadvantage based on multiple identity categories. Scholarship in this tradition asks researchers to consider how social statuses interact to yield complex patterns of privilege, disadvantage, and invisibility (Purdie-Vaughns et al., 2008). Insofar as our research fails to fully address these complexities, it risks potentially erasing the experiences of multiply-marginalised groups within STEM.

Considering how our tri-level model of organisational inclusion interacts with individuals with multiple stigmatised identities could yield several theoretical insights for future research. At the institutional level, gender-inclusive policies and practices may fail to serve the needs of employees if they do not consider how gender interacts with factors like poverty, race, and immigration status (Crenshaw, 1991). At the interpersonal level, an intersectional approach suggests that white women may hesitate to engage in acts of allyship that could be disruptive to a status-quo from which they reap some benefits (Hurtado, 1989). Women of colour may have less vested interest in maintaining the status quo and thus have a greater impetus to speak out against injustice in an organisation. Finally, an intersectional approach to identity pushes people to recognise commonalities that cut across simple groupings like gender (Cole, 2009). Recognising that oppression can operate across conventional identity categories may be helpful for grassroots organisers pushing for gender inclusion. For instance, women of colour and gay men may have shared experiences of stigmatisation (Cohen, 2020). Recognising common ground should help grassroots movements go beyond organising based on a single identity to building coalitions for collective action. This more inclusive approach should garner a broader support base for pushing towards organisational change (Cohen, 2020).

Occupational cultures

The systemic forces acting on a STEM workers' identities will also depend on the wider occupational culture surrounding the organisation. For instance, STEM disciplines have distinctive occupational cultures informed by the values, demographics, and history of specific fields. An established chemical engineering company might be cut from a different cultural cloth than a Silicon Valley tech start-up. The chemical engineering company might have organisational values steeped within a deep connection and respect for rigour and academic authority. The Silicon Valley start-up might find its cultural history within the rugged individualism of the West and values like “disruption” and “move fast and break things.” These differences in cultural values will translate into very different work cultures that have implications

for gender inclusion (Cheryan et al., 2017; Diekmann et al., 2017; Gino et al., 2015; Leslie et al., 2015). Future research will benefit from exploring how our model of organisational gender inclusion interacts with macro-level features like occupational cultures.

Summary

The central insight arising from our approach is that organisations need to consciously cultivate contexts where individuals can learn inclusive cultural norms. Once employees can learn these norms with a high degree of fidelity, strong self-sustaining group norms are more likely to emerge. Organizations that want to build and maintain inclusive organisational cultures need to take seriously features of human psychology that can be leveraged to this end. Our approach suggests that social learning processes and norms psychology should be at the centre of any effort for cultural change.

Conclusions

Women working in STEM report a lack of inclusion (Rosser & Lane, 2002; Seron et al., 2016). The past three decades of social psychology research has illuminated the way situations can elicit and mitigate gender-identity threat. This article summarised our program of work that has sought to isolate key aspects of inclusive workplace cultures in STEM. We reviewed research suggesting that gender-based inclusion can be collectively constructed from individual biases, interpersonal experiences, and institutional signals. This framework offers an approach to understanding how inclusion is both cued and experienced within a broader cultural context of an organisation. It also suggests actionable insights for creating inclusive work cultures. Creating contexts where employees can effectively learn inclusive norms will help organisations construct cultures where all their employees can thrive.

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