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Peer inclusion has a greater impact on belonging for students of color: best practices for instructors and administrators

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Students of color often face unique challenges in higher education, including lower levels of belonging. To understand these challenges, we administered a university climate survey across three colleges in the Wisconsin Alliance for Minority Participation (WiscAMP; $N = 3{,}370$) assessing a variety of outcomes related to students' educational experience and their well-being. Findings revealed that students who perceived higher peer inclusion reported a stronger sense of belonging; this effect was stronger among students of color. Sense of belonging had downstream effects on outcomes such as mental and physical health, confidence in success, and overall evaluations of their university. Our results suggest that peer inclusion is particularly important for students of color. Building on these findings, we highlight nine evidence-based practices that promote inclusion through peer interaction and classroom design. Examples include creating opportunities for students to interact with one another, establishing inclusion and respect as expected parts of classroom culture, and implementing programs that train peers to guide small groups through collaborative problem-solving and discussion. These findings position peer inclusion as a central lever for improving belonging and well-being, offering empirically grounded strategies for instructors and administrators seeking to support students of color.

KEYWORDS
belonging, diversity & inclusion, diversity in higher education, higher education, peer inclusion, STEM - science technology engineering mathematics, students of color in STEM

Introduction

Students from marginalized groups (e.g., students of color, women, LGBTQ+ students, first generation students, etc.) have on average less positive educational trajectories than their non-marginalized peers (Brown and Papp, 2025; Busch et al., 2023; Costello et al., 2018). Although students from different social groups face different obstacles, it is often the case that students from marginalized groups experience a lack of belonging in their university environments (Fan et al., 2020). This fact is troubling considering that a sense of belonging is crucial for well-being and academic success (Walton and Cohen, 2011). A decreased sense of belonging can lead to lower grades and a higher likelihood of university dropout (Patterson Silver Wolf et al., 2021). Particularly in STEM disciplines, students from marginalized groups who report a low sense of belonging are less likely to remain in their field of study and be

less engaged in STEM (Fisher et al., 2019; Harry et al., 2024). This underscores that sense of belonging plays a key role for academic success among students from marginalized groups.

Despite widespread attention to belonging, we know relatively little about the factors that shape belonging in daily student life. In this article, we focus on one specific factor that has particular theoretical and applied importance: peer inclusion. We will present the results from three university-wide climate surveys. As we will demonstrate via a path-analytic model, peer inclusion is crucial for the sense of belonging of all students, but it is especially important for students of color. Our model replicates past work showing that a sense of belonging is positively associated with students' self-reported mental health, physical health, confidence in success, and overall evaluations of their university. Based on our findings, we outline nine concrete practices that get students to behave more inclusively toward their peers in the discussion. We hope that this article will provide instructors and administrators with new insights and tools to promote the success of students from marginalized groups.

The importance of belonging

The need to belong is a fundamental human motivation (Baumeister and Leary, 1995; Maslow, 1970), and it is especially critical in university contexts (Osterman, 2000). Students' sense of belonging affects academic, social, and emotional outcomes, from persistence to well-being (Allen et al., 2024; Romeo et al., 2024). A higher sense of belonging can improve retention rates and result in better mental well-being (Gopalan and Brady, 2020; Gopalan et al., 2022; Hansen et al., 2024; Walton et al., 2023), whereas a lower sense of belonging is associated with lower levels of enjoyment, motivation, and persistence (Pedler et al., 2022). For this reason, it is imperative to enhance students' sense of belonging to improve educational trajectories. As belonging is often shaped by students' sense of affiliation and acceptance from others (Maghsoodi et al., 2023), students often feel a lower sense of belonging when they perceive a lack of social harmony—for instance, when they experience exclusionary behaviors or low levels of inclusive behaviors from peers (DeWall et al., 2011).

A sense of belonging is especially important for students of color in STEM (Hansen et al., 2024). As the Louis Stokes Alliance for Minority Participation (LSAMP) seeks to support underrepresented students in these fields, practitioners must consider evidence showing how belonging shapes students' experiences and success in STEM contexts particularly. For example, a greater sense of belonging is associated with increased academic performance, motivation, and persistence, with specific benefits for students of color (Strayhorn, 2010; Williams et al., 2017). A sense of belonging also can positively affect sense of efficacy and university experiences for students of color, which has downstream consequences on increased STEM and college success (Dortch, 2016; Hausmann et al., 2007). On the other hand, when a sense of belonging is absent for students of color, they feel more isolated and less willing to persist (Ovink et al., 2024; Rainey et al., 2018). Coordinated efforts by STEM instructors and administrators to cultivate belonging within STEM programs are particularly important, as program-level belonging can matter more for students of color than overall university belonging (Thoman et al., 2014).

Factors that affect a sense of belonging

Despite knowing how imperative a sense of belonging is for academic success, we do not have a full understanding of the factors that shape students' sense of belonging. Based on prior work by Lewis et al. (2016), it is likely that peer inclusion, especially when cultivated in classroom contexts, influences students' sense of belonging. In addition, Rainey et al. (2018) found four key factors found to contribute to sense of belonging for all students; among them was interpersonal relationships. We thus predict that peer inclusion will have a strong effect on sense of belonging among all students.

Previous research suggests that peer inclusion plays a particular important role for the sense of belonging of students of color, more so than for their peers. For example, Hussain and Jones (2021) found that peer interactions—particularly, diverse peer interactions—buffered against negative effects of discrimination and were overall crucial for a heightened sense of belonging among students of color at a PWI. While peer interactions are beneficial for all students (Strayhorn, 2019), the effect could be stronger for students of color as they are at a higher risk of facing microaggressions and stereotypes in STEM (Lee et al., 2020), and peer inclusion could serve a particularly important purpose to buffer against discrimination based on their identities (Marshall et al., 2021). Another explanation for this finding is that the underrepresentation of students of color in STEM (Riegle-Crumb et al., 2019) makes it harder for them to integrate themselves into a White-dominated culture (Strayhorn et al., 2013). A study by Murphy and Zirkel (2015) revealed that peer relationships and feelings of belonging in school predicted educational outcomes only for students of color. This pattern reinforces that peer inclusion may be especially critical for students of color. It is reasonable to infer that similar dynamics could arise in STEM contexts, where students of color are often underrepresented and may face heightened belonging uncertainty.

We tested these predictions in a climate survey across three universities in the Wisconsin Louis Stokes Alliance for Minority Participation (WiscAMP), which is a research partnership of 18 Wisconsin universities. WiscAMP is a part of the Louis Stokes Alliance for Minority Participation (LSAMP), which was a National Science Foundation-funded initiative designed to increase STEM participation among underrepresented minority students. Our climate survey assessed students' experiences with their university. While we assessed a number of constructs, of interest to us was to identify the factors that influence students' sense of belonging and, in turn, key outcomes—mental and physical health, confidence in their success, and overall evaluations of their university. Therefore, our central research question was to examine: does the relationship between peer inclusion and belonging differ for students of color and White students?

How to promote inclusive behaviors

If peer inclusion really plays a particularly important role for the sense of belonging of students of color—as the results reported below will show—the question is how to get students, especially students from non-marginalized groups, to behave

more inclusively. Existing attempts to promote peer inclusion are limited by two key shortcomings. First, many interventions focus on changing cognitions rather than actual behaviors. This approach is limited because attitudes are often resistant to change, and shifts in attitudes do not necessarily translate into changes in behavior (Brauer, 2024). Behavior-focused interventions like social norms messaging can be more effective in that they increase people's self-efficacy and usually address the barriers that currently prevent people from behaving inclusively (Campbell and Brauer, 2020; Costa, 2024).

Second, interventions that actually do target behaviors often emphasize the prevalence of discriminatory actions and encourage peers to refrain from them. However, this framing may overstate the extent to which most people engage in such behaviors. One framework that helps explain this is the concentrated discrimination account, which posits that in certain settings blatant acts of discrimination seem to be perpetrated by a numerical minority of individuals (the so-called "pareto principle", Campbell and Brauer, 2021). In other words, the problem is not that most students are actively discriminatory, but that many fail to engage in inclusive behaviors. An absence of inclusive behaviors from peers is not the same as the presence of discriminatory behaviors from peers. Furthermore, acts that reinforce a lack of inclusion can be just as, if not more, hurtful to students than outwardly discriminatory acts (Campbell and Brauer, 2021).

Therefore, in line with the special issue on "Catalyzing Change: Best Practices for Broadening Participation in STEM in the United States", which this article is a part of, our discussion will focus on methods that have been shown to promote peer inclusion, and thus the sense of belonging of students of color, in rigorous empirical research. We will present these methods in a concrete and straightforward manner and provide examples so that instructors and administrators can implement them easily.

Methods

Participants

We recruited participants in Spring 2024 from three midsize universities in the WiscAMP partnership. The universities enrolled between 7,000 and 16,000 undergraduates and had similar demographic characteristics. Across these universities, women represented on average 53.61% of students, and domestic White students accounted for 73.41%. One-quarter (24.79%) of students identified as domestic students of color—including those identifying as Black, Asian, Hispanic, or another race—while the remaining 1.79% were non-domestic, international students. About 43.22% of undergraduates were first-generation college students. Most students across the three universities were younger than 22 years old, and class standing was well balanced across cohorts.

The study sample consisted of $N = 3{,}370$ undergraduate students. The average institutional response rate was approximately 11%. Among those who reported demographic information, women were somewhat overrepresented in our sample (63.10% women, 32.42% men, with the remainder identifying as another gender). Conversely, domestic students of color were slightly underrepresented, with 18.80% identifying as non-White and 76.70% as White (with the remaining 4.50% identifying as international students or specifying that their race was not listed). 25.41% of participants identified as LGBTQ+, and one-third (33.88%) were first-generation students. Similar to the student body, respondents' average age was around 22 ($M = 22.39$, $SD = 6.66$).

Survey

Participants completed the questionnaire online using Qualtrics. They responded to items on 5-point Likert scales ranging from "1 = Strongly disagree" to "5 = Strongly agree", unless otherwise noted. Measures were drawn from previously validated instruments developed or adapted by Campbell et al. (2026) and Murrar et al. (2020), except where new measures were introduced. Additional constructs not described here are reported in other manuscripts (see Redd, Kennedy, & Brauer, this volume; and Supplementary Materials).

Peer inclusion

To assess the degree to which students felt that their peers were inclusive, we included two questions. The first question was "The majority of students at [University] make an effort to behave inclusively", and the second question was "It's a norm among [University] students to be welcoming to students from all social groups".

Sense of belonging

Students' sense of belonging in their university environment was assessed with four questions ("I feel as though I belong in this school and community", "I feel that others at [University] treat me in a welcoming and inclusive manner", "I feel that the other students in my classes value my thoughts and opinions", and "The atmosphere in my classes makes me feel like I belong"). To capture belonging across students' broader university context (i.e., both university-wide and classroom settings), we combined two items assessing university belonging with two items assessing classroom belonging from Murrar et al. (2020). The resulting composite score demonstrated good internal consistency ($\alpha = .89$).

Mental health

Students were asked one question to rate their overall mental health ("Please rate your mental health over the last 30 days") on a 5-point Likert scale from "1 = Poor" to "5 = Excellent".

Physical health

Students were also asked one question to evaluate their overall physical health ("Please rate your physical health over the last 30 days"). The same 5-point Likert scale used to assess mental health was used to assess physical health.

Confidence in success

Students were asked: "How confident are you that you will succeed at [University]?" This question was assessed on a

5-point Likert scale from "1 = Not at all confident" to "5 = Extremely confident".

Overall evaluations

Overall evaluations of students' university experience were measured with three items. The first and second items ("Would you recommend [University] to future students?" and "If you could start over again, would you go to [University]?") were assessed on a 5-point Likert scale from "1 = Definitely not" to "5 = Definitely yes". The third item ("How would you evaluate your entire educational experience at this institution?") was measured on a 5-point Likert scale from "1 = Poor" to "5 = Excellent".

Race/ethnicity coding

Participants were grouped based on racial and ethnic identity for analytic purposes. Individuals were classified as "students of color" and coded as +0.5 if they identified as U.S. nationals exclusively and reported a racial or ethnic identity other than White, including Black, Hispanic, or multiracial identities. This grouping necessarily combines students from varied racial and ethnic backgrounds whose experiences in STEM environments may differ in important respects. Nonetheless, this broader categorization allowed us to investigate general patterns of inclusion and exclusion while preserving adequate statistical power. Participants who identified solely as White and reported U.S. nationality were categorized as "White students" and coded as −0.5.

Participants who identified as Asian ($N = 91$) or Asian and White ($N = 27$) were not included in these analyses. This decision reflected the study's focus on differences involving groups that, on average, tend to experience lower academic achievement in STEM fields. Although Asian students encounter challenges related to belonging, prior research indicates that they are generally not underrepresented in STEM disciplines and often show comparable or stronger academic outcomes relative to other groups (Fischer, 2007; National Center for Science and Engineering Statistics, 2024; U.S. Census Bureau, 2023; Whitcomb and Singh, 2021).

Participants who did not respond to the race/ethnicity item or selected only "Not listed, please tell us:" were also excluded. After applying these criteria, the final analytic sample consisted of 2,220 students, including 327 students of color.

Procedure

Data collection was coordinated through the provost's office at each participating university. To recruit participants, Provosts distributed two separate messages to their student bodies. The first message, sent one to two weeks prior to survey launch, described the study's goal (to inform efforts to improve the student experience), outlined the expected time commitment, and notified students that a survey link would follow. Students were also told that their responses would be used for research and that survey completion would enter them into a raffle for a $50 gift card. The second message contained the live Qualtrics survey link. The survey remained open for two weeks, during which students could participate at any time.

Results

The questions assessing peer inclusion, sense of belonging, and overall evaluations were averaged to create three composite scores, which we used in subsequent analyses. The descriptive statistics for all variables (i.e., peer inclusion, sense of belonging, and all outcome variables) are shown in Table 1.

Path-analytic model

We mean-centered peer inclusion prior to analysis to aid interpretation of lower-order effects. We then estimated a path-analytic model in which peer inclusion, race/ethnicity, and the product between peer inclusion and race/ethnicity were predictors of sense of belonging. Sense of belonging was specified to predict our key outcomes (see Figure 1). We included two orthogonal contrast codes to control for institutional differences across the three participating universities. We estimated the hypothesized moderated mediation model with the lavaan package (version 0.6–19; Rosseel, 2012) in R (version 4.4.1), with maximum likelihood estimation and standard errors. All reported coefficients below are unstandardized estimates.

The path-analytic model demonstrated good fit to the data, $\chi^2(12) = 49.04$, $p < .001$, CFI = 0.991, TLI = 0.973, RMSEA = 0.037 [90% CI (0.027, 0.048)], SRMR = 0.017. These indices show that the model provided an excellent representation of the observed covariances among the study variables. As can be seen in Figure 1, peer inclusion was a strong, positive predictor of sense of belonging [$b = 0.57$, $SE = 0.02$, 95% CI (0.52, 0.61)]. The main effect of race/ethnicity (students of color vs. White students) was negative but nonsignificant [$b = -0.06$, SE = 0.04, 95% CI (−0.14, 0.01)]. More importantly, the interaction between peer inclusion and group status was positive and significant [$b = 0.09$, SE = 0.05, $p = .046$, 95% CI (0.00[1], 0.18)], suggesting that peer inclusion is a stronger predictor of sense of belonging for students of color than for White students.

Sense of belonging predicted all four outcomes. Higher sense of belonging was associated with greater mental health [$b = 0.47$, $SE = 0.03$, 95% CI (0.42, 0.53)], physical health [$b = 0.35$, $SE = 0.03$, 95% CI (0.30, 0.41)], confidence in success, [$b = 0.53$, $SE = .02$, 95% CI (0.48, 0.57)], and students' overall evaluations of their university [$b = 0.66$, $SE = 0.02$, 95% CI (0.62, 0.70)]. Together, these results show that sense of belonging is strongly associated with students' well-being, motivation, and satisfaction with the university.

[1]Lower bound rounded to 2 d.p.; actual lower bound=0.002 (CI does not include 0).

TABLE 1 Descriptive statistics, Cronbach's alpha, and correlations of the variables included in path-analytic model.

Outcome variables	*M*	*SD*	α	(1)	(2)	(3)	(4)	(5)	(6)
(1) Peer inclusion	3.84	0.84	0.87	1.00					
(2) Sense of belonging	3.93	0.77	0.89	0.58***	1.00				
(3) Mental health	2.79	1.05		0.24***	0.35***	1.00			
(4) Physical health	3.25	1.05		0.18***	0.26***	0.53***	1.00		
(5) Confidence in success	4.04	0.87		0.25***	0.47***	0.38***	0.31***	1.00	
(6) Overall evaluations	3.80	0.88	0.87	0.41***	0.60***	0.30***	0.20***	0.50***	1.00

***$p < .001$.

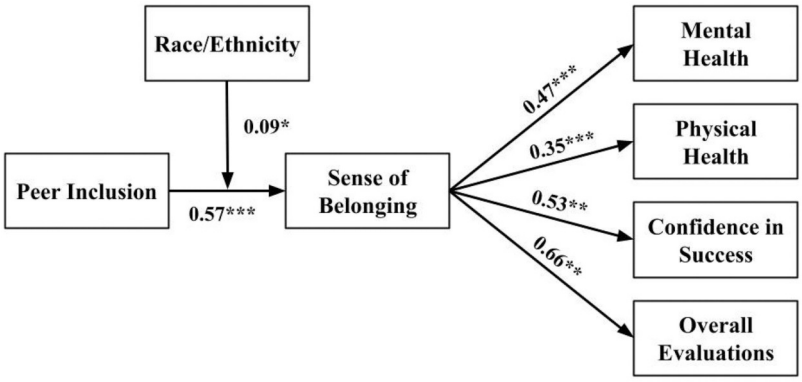

FIGURE 1
Model of peer inclusion and sense of belonging predicting student outcomes, with unstandardized estimates.

Linear regression

To examine our path-analytic model further, we ran a general linear model in which we regressed sense of belonging on peer inclusion (mean-centered), race/ethnicity (contrast coded), and their interaction. In this simpler model, the interaction term also reached significance, $t(2,211) = 1.99$, $p = .046$, $\eta^2 = 0.00$, providing additional evidence that the relationship between peer inclusion and sense of belonging is stronger among students of color than among White students (see Figure 2). Importantly, at high levels of peer inclusion, there is no group difference, suggesting that high peer inclusion can fully eliminate the sense of belonging gap.

Indirect effects

The path-analytic model allowed us to determine whether the indirect effect from peer inclusion to each of the four outcome variables were moderated by race/ethnicity. As can be seen in Table 2, the tests of the moderated mediation showed that all four indirect effects were stronger for students of color than for White students. These results indicate that peer inclusion plays a more important role for major academic outcomes among students of color.

Summary

Taken together, our results provide support for the proposed model. Peer inclusion significantly predicted students' sense of belonging, which in turn predicted multiple indicators of adjustment and success. The effect of peer inclusion on sense of belonging was stronger for students of color than for White students. In addition, the indirect effects of peer inclusion on the four outcome measures through sense of belonging were stronger for students of color than for White students. These findings suggest that peer inclusion is crucial for students of color, providing an important pathway to improve sense of belonging, health, and academic persistence.

Best practices to promote peer inclusion

Given that peer inclusion plays a key role for all students but is particularly important for students of color, the question becomes: how can we create inclusive learning environments where students from all backgrounds feel respected and welcomed by their peers? In the following sections, we will summarize recent advances on this question, focusing on best practices that have been evaluated in empirical research. The first section describes the insights from a recent study examining the effectiveness of

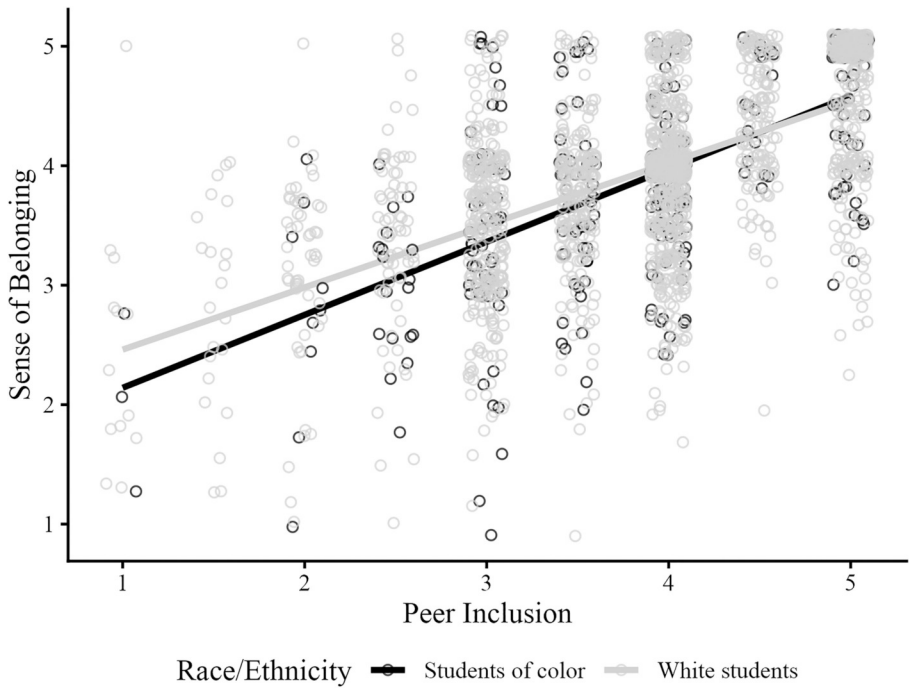

FIGURE 2
Sense of belonging as a function of peer inclusion and race/ethnicity.

classroom peer inclusion strategies, that instructors can use to shape peer interactions. The next section details other best practices that have been proposed in the literature and that STEM administrators and coordinators can implement to improve students' university experiences for all students. Our goal is to provide resources to cultivate peer inclusion in university settings—particularly within STEM environments. For each of the practices, we give concrete examples on evidence-based best practices that are particularly relevant for LSAMP program coordinators and instructors.

Despite the utility of our findings, several limitations should be considered. First, the 11% response rate raises the possibility of nonresponse bias, as students who chose not to participate may systematically differ from those who completed the survey. Second, the relatively small analytic sample of students of color (N = 327) required combining multiple racial and ethnic groups, which may obscure meaningful differences across these populations. Finally, although the interaction was statistically significant in both the path model and linear model, the effect size was small, suggesting that the magnitude of this relationship should be interpreted cautiously. Nevertheless, peer inclusion may still represent an important factor in student success, particularly when considered alongside other influences on belonging and academic outcomes.

TABLE 2 Indirect effects of peer inclusion on student outcomes via sense of belonging broken down by race/ethnicity, with unstandardized estimates.

Outcome variables	Students of color *b*	White students *b*	Difference
Mental health	0.29	0.25	0.04*
Physical health	0.22	0.18	0.03*
Confidence in success	0.32	0.27	0.05*
Overall evaluations	0.40	0.34	0.06*

Unrounded estimates were used in all calculations.
*$p < .050$.
**$p < .010$.
***$p < .001$.

Improving peer relations in the classroom

In a recent paper, Kennedy et al. (2025) identified ways to get students to behave more inclusively toward their peers. The authors developed an "Inclusion" intervention—six teaching practices presented on a website to use throughout the semester—that instructors can employ to promote prosocial peer interactions. Students in courses in which the instructor had implemented this intervention earned higher grades than those in control classes, with the strongest benefits observed for students of color. A second "Resilience" intervention, designed to help students of color cope with adversity, showed little effect—reinforcing the idea that peer inclusion is critical for their success. The six practices from the Inclusion intervention and example implementations are described belowin Table 3; further details are available in the Supplementary Materials of Kennedy et al. (2025).

Foster student contact

Face-to-face interaction is one of the strongest tools for reducing prejudice and discrimination. Research shows that

TABLE 3 Inclusive teaching practices and example classroom applications.

Practice	Short definition	Implementation examples
Foster student contact	Instructors create repeated opportunities for inclusive face-to-face student interaction.	1. First-day introductions: Students meet nearby classmates to start building connections. 2. Randomized groups: Assign groups randomly and rotate membership across activities. 3. Encourage study connections: Have students share contact info and form study groups.
Promote cooperation	Instructors structure learning activities to encourage collaboration and shared responsibility.	1. Peer-first help seeking: Students ask classmates for help before instructors. 2. Group accountability: Set clear participation expectations and consequences. 3. Collaborative norms: Have groups discuss teamwork and support quieter peers.
Individualize students	Instructors help students feel known and valued as individuals rather than anonymous class members.	1. Use students' names: Learn and consistently use names in class and communication. 2. Encourage name learning: Prompt students to learn and use each other's names. 3. Structured self-sharing: Use icebreakers or informal conversations to share personal details.
Make inclusion normative	Instructors signal that inclusive behavior is expected and valued in the classroom.	1. Share inclusion data: Show surveys or campus info demonstrating most students value inclusion. 2. Use inclusive visuals: Display posters or videos showing diverse interactions. 3. Lead brief discussions: State instructor commitment and invite student input.
Foster social belonging	Instructors help students feel they belong and that their presence is valued.	1. Normalize challenges: Present everyday obstacles as common and temporary. 2. Emphasize shared experience: Highlight what all students have in common. 3. Affirm belonging: Signal that students of color are legitimate members of the university.
Promote positive group perceptions	Instructors encourage nuanced, accurate views of social groups to reduce bias.	1. Highlight diversity: Avoid stereotypes and show group complexity. 2. Correct misconceptions: Address false beliefs about admissions or advantages. 3. Show role models: Present diverse examples of success in relevant fields (e.g., STEM).

stereotypes become more extreme when people form impressions through communication about groups rather than direct behavioral observation (Brauer et al., 2003). When students have the chance to interact face-to-face, they are more likely to feel empathy, reduce intergroup anxiety, and take the perspective of others (Pettigrew and Tropp, 2008). These small but repeated moments of contact help build bridges across social groups and foster inclusion. In practice, instructors can create these opportunities by asking students to introduce themselves to the people sitting nearby on the very first day of class. This simple activity lowers barriers and sets a welcoming tone (Sasan et al., 2023). In group projects, forming groups randomly rather than allowing self-selection ensures that students do not always remain in familiar circles, expanding their networks and increasing the likelihood of cross-group friendships (Pulgar et al., 2025). Requiring students to introduce themselves each time groups are reshuffled further reinforces interpersonal connection. Beyond the classroom, instructors can encourage students to exchange contact information and form study groups. These practices not only promote collaboration but also reduce the social isolation that students of color often face. Over time, repeated structured and informal contact helps normalize

inclusion and builds a classroom climate in which diverse friendships and cross-group engagement are expected.

Promote cooperation

Promoting cooperation between students has been shown to boost academic performance and improve the classroom climate (Van Ryzin et al., 2020; Smalley and Hopkins, 2020). Competitive or hostile environments are not conducive to learning, and students from underrepresented groups are often especially harmed in competitive spaces (Long and Mejia, 2016). By cultivating cooperation, instructors reduce these inequities and create more supportive academic communities. A first step is encouraging students to use one another as resources for content-related questions before turning to instructors, signaling that peers are valuable sources of knowledge. Instructors can also clarify the consequences of failing to contribute to group work, which reinforces responsibility and prosocial behavior. Assignments can be structured to promote active collaboration and positive communication. For example, after forming groups, students might discuss the qualities of effective teamwork and establish shared expectations for participation. Instructors can also enlist talkative students to support quieter peers in contributing to discussions. These structures turn classrooms into communities of shared learning, improving performance for all students and narrowing achievement gaps.

Individualize students

Individualizing students—making them feel known and valued as individuals rather than anonymous faces—significantly enhances academic engagement (Davis et al., 2025). Instructors can take straightforward steps to promote individualization; for example, they can learn students' names and use them consistently in both classroom and email interactions. When instructors model such behaviors students likely feel encouraged to individualize each other as well. Personal conversations, whether before or after class or during office hours, can build rapport between peers and show each other that their presence matters. To help students feel like individuals, instructors can explicitly encourage students to learn each other's names and explain why doing so is important for building a supportive environment. Icebreaker activities on the first day, where students share names and fun facts, give students opportunity to share information about themselves so that their peers see them as individuals with specific hobbies and preferences. These small practices, whether prompted by the instructors or practiced by the students, communicate that each student is a valued member of the class community, which strengthens belonging and motivates more active engagement in learning.

Make inclusion normative

Human beings are deeply influenced by social norms (Asch, 1951), and classrooms are no exception. Establishing inclusion as a visible and explicit social norm can transform how students interact and significantly improve the experiences of marginalized groups (Museus et al., 2018). When inclusion is made normative, students are more likely to internalize it as the expected standard of behavior, which reduces the achievement gap (Moreu and Brauer, 2022; Murrar et al., 2020; Townsend et al., 2018). Students may also be persuaded to adopt inclusive behaviors to be consistent with their own pro-diversity values (Isenberg and Brauer, 2022). Instructors can highlight survey results showing that the majority of students on campus value inclusion, reinforcing that these values are widely shared (Campbell et al., 2026). Classroom visuals, such as videos or posters, that show people interacting across diverse identities also signal that inclusion is central to the learning environment (Murrar et al., 2020). A brief, structured discussion about inclusion—where the instructor states their own commitment and invites student input—further reinforces this expectation. Crucially, when promoting these norms, it is important not to dismiss or invalidate the real experiences of students who have faced discrimination. Instead, norms should affirm that inclusion is a collective commitment, while also acknowledging that exclusionary experiences exist and must be addressed. Over time, these explicit signals shape classroom culture so that inclusive behavior is not exceptional but expected, benefiting both students of color and White students.

Foster social belonging

Helping students feel that they truly belong at the university has a powerful impact on their academic success (Walton et al., 2023). Students of color often interpret everyday challenges (e.g., social difficulties) as signals that they do not fit in (Easterbrook and Hadden, 2020; Walton and Cohen, 2011). As stated above, it is important not to overlook legitimate concerns about authentic, identity-related barriers; however, instructors can attempt to normalize certain everyday challenges and state that most students are able to overcome them. By emphasizing commonality across all students, students of color may receive a particular message that they belong and that their presence at the university is legitimate. When these challenges are reframed as temporary rather than permanent barriers and they are viewed as a normal part of the university population, they may then see less of a barrier between themselves and their peers. As a result, the student may perceive their peers as more inclusive. And that perception may even cause them to be more open to intergroup contact, which may then lead to their peers to actually behaving more inclusively.

Promote positive group perceptions

Encouraging students to develop more accurate and nuanced understandings of social groups reduces prejudice and fosters inclusive behavior (Museus et al., 2018). Stereotypical, fixed portrayals can reinforce bias and exclusion (Simão and Brauer, 2015), while highlighting variability within groups challenges assumptions and broadens perspectives (Er-Rafiy and Brauer 2012; Thiem and Dasgupta, 2022). Instructors can start by carefully avoiding examples that present characters or groups in

stereotypical ways. Instead, they can explicitly frame social groups as diverse and internally complex, ensuring that students do not assume all members of a group think or act alike. Addressing misconceptions directly is also important. For example, if students suggest that students of color are admitted with lowered standards or receive unfair advantages through scholarships, instructors can gently correct these views and explain that this is not the case at their university and that, following recent Supreme Court rulings and federal guidance, admissions decisions cannot be based on race. Highlighting diverse role models in STEM or other fields also expands students' ideas of who belongs and who succeeds. By challenging stereotypes and emphasizing complexity, these practices promote more positive intergroup impressions (Soicher et al., 2024).

Importantly, none of these best practices focus on encouraging students to stop discriminatory behavior; rather, they empower students to start practicing more inclusive behaviors. The table below provides examples for classroom implementation of these practices (see also Kennedy et al., 2025).

Taken together, when instructor encourage students to engage in the above activities in a classroom setting, the students will begin to exhibit more inclusive behaviors in which they are actively talking to new people (some of different social groups) and forming authentic connections. Such behaviors then can become the foundation for a sense of belonging in the classroom and subsequently in the university environment, which likely will be of particular benefit to students of color.

Other practices to foster peer inclusion

While instructors can implement the teaching practices detailed above to improve peer inclusion, there are a number of ways for STEM leadership to foster inclusive behaviors among peers in a university setting, including peer-led team learning (PLTL), intergroup dialogue, and multi-component programs. Although all of them are different, they share the key idea that the environmental context must be suitably adapted for students from marginalized backgrounds to be able to thrive, rather than placing the burden on students to overcome unsupportive environments. They also emphasize the importance of actively practicing inclusive behaviors, as simply changing cognitions or reducing discriminatory actions often fail to create an inclusive environment. STEM administrators and coordinators may implement these programs to promote peer inclusion and improve the university experience for students of color.

Peer-led team learning (PLTL)

Peer learning can be a critical tool to help students of color, as it has been associated with improved student well-being (Pointon-Haas et al., 2023). One particular method is referred to as "peer-led team learning", or PLTL. PLTL is a small-group instructional model in which six to eight students meet weekly with a trained undergraduate peer leader to collaboratively solve course problems. The peer leaders, who have successfully completed the course, are trained as facilitators rather than tutors, creating an interactive environment where students actively work toward their own understanding (Wilson and Varma-Nelson, 2016). Originating in chemistry in the early 1990s, PLTL has since been implemented across STEM disciplines nationwide and is now widely recognized as an integrated course component rather than a remedial add-on.

The theoretical foundation of PLTL is grounded in social constructivism, which emphasizes that knowledge is built through dialogue and collaborative problem-solving (Wilson and Varma-Nelson, 2016). The foundation aligns closely with social learning theory, which underscores the role of peers as relatable role models—an especially important factor for students of color who likely benefit from seeing leaders who look like them (Hickman, 2016). Finally, the design of PLTL equalizes access to resources and embeds fairness into learning, echoing findings across multiple STEM contexts highlighting PLTL as a structural equity practice (Snyder et al., 2016).

Intergroup dialogue

Intergroup dialogue is a structured educational practice that brings together students from different social identity groups for sustained, facilitated conversations about diversity, inequality, and social justice (Walsh, 2007). Unlike unstructured class discussions, which can reproduce existing hierarchies, intergroup dialogue is intentionally designed to ensure balanced participation and respectful engagement (Mitchell et al., 2016). Small groups of students, co-facilitated by trained instructors, meet regularly to share experiences, challenge assumptions, and develop collaborative skills. These spaces give students the chance to explore their own identities while learning to validate the perspectives of others, fostering a classroom climate where marginalized voices are not sidelined but centered (Nagda et al., 2009).

The approach rests on several theoretical foundations. Allport's (1954) contact hypothesis suggests that sustained, equal-status interaction between groups can reduce prejudice; intergroup dialogue operationalizes this concept by structuring dialogue around shared goals and cooperative problem-solving (Nagda et al., 2009). The practice also builds on perspective-taking theory, emphasizing that listening to and empathizing with peers' lived experiences helps reduce bias and increase prosocial behaviors, particularly when structured reflection and storytelling are included (Trentham et al., 2020). Finally, intergroup dialogue reflects traditions of democratic and critical pedagogy, where the objective is not to "fix" students from marginalized groups but to transform the educational environment itself. This is especially evident in STEM-focused intergroup dialogues, where women participants have used dialogue to analyze structural inequities and build collective strategies for inclusion (White et al., 2021).

Multi-component programs

Another approach to fostering peer inclusion is through multi-component programs—structured initiatives that combine mentoring, academic support, research experiences, and often financial resources (Nelson et al., 2023). Rather than

addressing one issue, these programs integrate multiple supports to help students of color feel a sense of belonging and success in STEM. The peer component is especially valuable, as students interact with one another through mentoring and research and learn to respect different backgrounds, check biases, and build collaborative networks that promote positive peer interactions (De Los Rios et al., 2023; Meyer et al., 2025). These programs also cultivate a "program habitat", or culture of trust, where staff and mentors model inclusive collaboration that students carry into their own peer relationships (Bailey, 2015).

A wide range of multi-component programs have proven effective in promoting peer inclusion. One national review found that programs embedding group mentorship and cohort-based structures encourage students to engage across differences (Palid et al., 2023). For example, Minority Research & Training programs illustrate how layered approaches combining academic training and mentorship foster sustained engagement. Minority Research and Training programs prepare students for PhD-level work with mentored research and professional development. In one such program implemented at a research-intensive university, students collaborated in diverse research teams and mentored younger participants, thereby promoting inclusion through peer collaboration (Burton et al., 2019).

Conclusion

A heightened sense of belonging contributes to a positive academic and university experience for all students. A sense of belonging can be especially important for students of color, who navigate university difficulties with an added layer of complexity in their racial identities. Students of color in STEM can face additional pressures in a largely competitive learning environment. Understanding what factors boost belonging for students of color helps universities implement targeted interventions, one of the key missions of the Louis Stokes Alliance for Minority Participation (LSAMP). In the present study, our climate survey probed students about various facets of their university experience with the intent to isolate key factors contributing to sense of belonging at their university. We replicated earlier findings that belonging significantly affects important educational outcomes. Importantly, we found that perceiving peers as inclusive was a key predictor of belonging for all students, with significant benefits for students of color.

Our findings have direct implications for the success of students of color. By promoting peer inclusion within university settings, we can create environments where students of color feel welcomed and supported—contributing to a positive university experience. We highlighted recent research demonstrating how instructors can help to foster peer inclusion in the classroom using six key teaching practices and examples to implement each. We then discussed other strategies that can be implemented at universities such as peer-lead team learning, intergroup dialogue, and multi-component programs. All these programs are structured such that peers can have sustained, positive contact with each other, which can boost perceptions of peer inclusion at universities and lead to better university outcomes among students of color. It is our hope that by outlining actionable ways in which universities can foster positive peer-to-peer interactions, students can feel included in their university environments and students of color particularly can experience positive trajectories in their academic experience.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by University of Wisconsin—Madison Institutional Review Board. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

KR: Data curation, Formal analysis, Project administration, Software, Validation, Visualization, Writing – original draft, Writing – review & editing. MB: Conceptualization, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Writing – review & editing.

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Conflict of interest

The author(s) declared that this work was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

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