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Difference-education is an intervention that addresses psychological barriers that can undermine the academic performance of first-generation college students (i.e., those who have parents without 4-year degrees). Difference-education interventions improve first-generation students' performance by empowering them to navigate higher education environments more effectively. They also improve students' *comfort with social group difference*. However, these benefits have only been documented in higher-resourced institutions. The present research asks two questions about whether these benefits also extend to lower-resourced institutions—that is, schools with fewer resources to invest in students than the universities where prior difference-education interventions were delivered. First, is difference-education effective in improving first-generation students' academic performance in lower-resourced institutions, and does it do so by increasing empowerment? Second, does difference-education improve *comfort with social group difference* in lower-resourced institutions, and is it unique in its ability to do so? With students from four lower-resourced institutions, we examined these questions by comparing the results of a difference-education intervention to a control condition and social-belonging intervention. We found that while some benefits of difference-education interventions extend to lower-resourced institutions, others do not. First, like prior interventions, difference-education improves first-generation students' academic performance and *comfort with social group difference*. Unlike prior interventions, these effects did not persist beyond the first term and students' academic performance benefits were not explained by empowerment. We also found partial evidence that the benefits for *comfort with social group difference* were unique compared to a social-belonging intervention.

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Public Significance Statement

The majority of first-generation college students attend lower-resourced institutions (i.e., less selective schools with fewer financial resources). Yet, prior difference-education interventions have been conducted only at higher-resourced institutions (i.e., more selective schools with greater financial resources). This study asks whether the academic benefits of difference-education extend to four institutions that have fewer resources than sites where prior difference-education interventions have been delivered. We find that some of the benefits extend, and some do not. Specifically, in contrast to prior difference-education interventions, which demonstrated academic performance benefits for first-generation students throughout college, we find that difference-education in lower-resourced institutions improves first-generation students' grades only through the fall term. Moreover, in contrast to prior difference-education interventions, which showed that students' grades improved through a sense of empowerment, we find that difference-education in lower-resourced institutions did not increase empowerment. While these results suggest that the benefits of difference-education are somewhat dampened in lower-resourced contexts due to the different structural and psychological barriers students contend with, the intervention can still offer some benefits to first-generation students.

For students from diverse social class backgrounds, the playing field at U.S. colleges and universities is far from level (Sirin, 2005). Compared to students who have one or more parents with a 4-year college degree (i.e., continuing-generation students), students who do not have parents with a 4-year degree (i.e., first-generation students)[1] often face greater psychological barriers. For example, they often confront cultural mismatches between their working-class backgrounds and the middle- and upper-class culture of universities, particularly at elite schools (Dittmann et al., 2020; Goudeau & Croizet, 2017; Phillips et al., 2020; Stephens, Fryberg, et al., 2012; Stephens, Townsend, & Dittmann, 2019; Stephens, Townsend, et al., 2012). These mismatches can undermine first-generation students' sense of fit or belonging and also reduce their sense of empowerment in college (e.g., Housel & Harvey, 2009; Ostrove & Long, 2007; Reay et al., 2009; Stephens, Brannon, et al., 2015). These psychological barriers work together with disparities in resources and precollege preparation to fuel social class gaps in academic performance (Reardon, 2011).

One effective way to address these types of psychological barriers and thereby reduce social class gaps in academic performance is through a social–psychological intervention called difference-education. Difference-education interventions have been shown to improve first-generation students' academic performance by increasing students' empowerment in college (Stephens et al., 2014; Townsend et al., 2019). They also have been shown to improve first- and continuing-generation students' *comfort with social group difference* (e.g., an ease and/or willingness to engage with difference; Stephens, Townsend, et al., 2015; Townsend et al., 2021).

Like the social–psychological intervention literature more broadly, research on difference-education interventions has mostly focused on demonstrating effects (Stephens et al., 2014; Townsend et al., 2019). However, in this next phase of research, it is important to begin to better understand the contextual conditions (e.g., institutions' financial resources) that are necessary for difference-education to yield benefits. Specifically, the benefits of difference-education interventions have mostly been documented in elite institutions that have a high level of financial resources to invest in students. We therefore do not know if these interventions are only effective in these higher-resourced institutions. That is, are high levels of institutional financial resources—and the opportunities that they afford for students—necessary for difference-education interventions to produce benefits?

We seek to answer this question with a convenience sample of educational institutions that differ from prior intervention sites in their level of institutional financial resources. We refer to these institutions as lower-resourced.[2] Importantly, these are the types of institutions most first-generation college students attend (Fry & Cilluffo, 2019). We define lower-resourced institutions as those that have fewer resources to invest in supporting students than the institutions where previous difference-education interventions were delivered (i.e., based on institutions' endowments and the cost of attendance both before and after financial aid; see Table S4 in the online supplemental materials).

More specifically, we ask two key questions. First, is difference-education effective in improving first-generation students' academic performance in these lower-resourced institutions, and if so, does it do so by increasing their empowerment? Second, does difference-education improve *comfort with social group difference* in these

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[1] Although generation status and income status are correlated, we focus on generation status, rather than family household income, because difference-education interventions are designed to target cultural or psychological barriers (as opposed to financial or structural barriers). These cultural and psychological barriers are most closely linked to whether students have been socialized in households with parents who have 4-year college degrees (see Stephens, Fryberg, et al., 2012; Stephens et al., in press).

[2] We had initially hoped to compare our results across the different institutions in our sample (e.g., community college versus 4-year university). However, due to the problems with sample size noted below, we collapsed across the four institutions. All four institutions had fewer resources than the contexts where prior difference-education interventions have been delivered—that is, they were relatively lower-resourced. Future research could also compare institutions based on more objective standards for "low levels" of resources.

institutions, and does it uniquely do so compared to other social–psychological interventions? With a convenience sample of four institutions that have fewer resources than previous sites where difference-education interventions were delivered, we seek to answer these questions by comparing the results of a difference-education intervention to a control condition and another common social–psychological intervention (i.e., a social-belonging intervention; Walton & Cohen, 2007).

In the sections below, we first provide an overview of our theorizing about how difference-education interventions improve students' outcomes, as well as the research in higher-resourced institutions that supports this theorizing. Then, we discuss how fewer institutional financial resources in an educational context could impact the effectiveness of difference-education interventions.

The Benefits of Difference-Education in Higher-Resourced Institutions

Like other social–psychological interventions, difference-education interventions improve students' academic outcomes by targeting psychological barriers. In particular, they seek to change students' lay theories, or ways of making sense of their experiences (Walton & Wilson, 2018; Walton & Yeager, 2020; see also Wilson et al., 2002; Wilson & Linville, 1982, 1985). Changing their lay theories can, in turn, improve students' academic outcomes by reducing psychological barriers—in this case, by empowering them to behave differently.

The defining feature of difference-education interventions is their use of contrasting real-life stories of students from diverse social class backgrounds to convey a contextual theory of difference—an understanding that their diverse life experiences and backgrounds are likely to give rise to different experiences in college (Stephens, Hamedani, & Townsend, 2019). Observing how other students' current experiences in college vary as a function of their different backgrounds helps intervention participants learn that their own, particular college experiences are contextual—that is, a product of their life experiences and backgrounds. By teaching students this lay theory, the intervention helps students to better understand the contextual sources of the challenges they confront in college. Furthermore, it can enable students to recognize that their differences need not be seen as negative or limitations but can also be positive and serve as assets (Stephens, Hamedani, & Townsend, 2019). Previous research in elite, higher-resourced institutions has found that difference-education interventions improve two key outcomes: academic performance and *comfort with social group difference*.

Difference-Education Interventions Improve Academic Performance Through Empowerment

First, difference-education interventions improve the academic performance of first-generation students by increasing their empowerment (i.e., both the psychological experience and behavioral tendency to seek out campus resources). They increase empowerment by helping students to better understand the contextual sources of the challenges they confront in college. When students learn that their challenges result from experiences in different contexts (e.g., not having college-educated parents), rather than individual deficiencies, it becomes clear that they can take action to change their experiences and outcomes in the future. This understanding should help students feel more efficacious and in control of their

experiences and outcomes, and at the same time, foster willingness to take appropriate action. Previous evaluations of difference-education in higher-resourced settings have shown that the intervention improves first-generation students' grade-point averages (GPAs) by increasing empowerment: the psychological sense of feeling prepared, in control, and efficacious, as well as the behavioral tendency to seek campus resources (e.g., help-seeking; Stephens, Hamedani, & Townsend, 2019; Townsend et al., 2021).

Difference-Education Interventions Improve Comfort With Social Group Difference

Second, difference-education interventions improve students' *comfort with social group difference* (e.g., Townsend et al., 2021). As explained earlier, difference-education interventions convey a contextual theory by showcasing how students' backgrounds shape both their strengths and challenges in college. The contextual theory teaches students that their experiences of difference are normal and a product of their different backgrounds. As such, students learn that differences need not be negative but also have the potential to be positive assets or strengths. The intervention can, therefore, lead students to experience greater *comfort with social group difference*: an ease and/or willingness to engage with their own and others' social group differences. In higher-resourced institutions, previous evaluations of difference-education interventions have shown that they improve students' appreciation of diversity, foster higher levels of perspective-taking, and increase participation in identity-relevant activities (Stephens et al., 2014; Stephens, Townsend, et al., 2015; Townsend et al., 2021).

Do Difference-Education Interventions Improve First-Generation Students' Academic Performance in Lower-Resourced Institutions by Increasing Empowerment?

To what extent are the benefits of difference-education—an intervention that improves academic outcomes by reducing psychological barriers—likely to extend to relatively lower-resourced institutions? To answer this question, we consider how differences in structural and psychological barriers in lower-resourced institutions may affect the processes through which difference-education interventions benefit students.

Difference-Education Interventions Could Be Less Effective in Lower-Resourced Institutions

One reason why difference-education interventions could be less effective is that students in lower-resourced institutions often face additional structural barriers (Goldrick-Rab et al., 2014; Scott-Clayton, 2018). For example, they tend to have less financial support from their institution (e.g., fewer scholarships) and less access to the types of programs that support student success (e.g., tutoring; Yuen, 2020). These additional structural barriers could interfere with students' ability to benefit from increased empowerment, the psychological process through which difference-education improves students' academic performance (e.g., Stephens, Hamedani, & Townsend, 2019). For example, since lower-resourced institutions offer fewer student support resources, increasing students' experiences of

empowerment (e.g., seeking out resources when resources are less available) may be less likely to improve their academic outcomes.[3]

Another reason difference-education interventions could be less effective is that lower-resourced institutions tend to present first-generation students with fewer of the types of psychological barriers that difference-education is designed to address (e.g., feeling a lack of fit or empowerment; Murphy et al., 2020). Indeed, lower-resourced institutions tend to have cultures that are less elite than higher-resourced institutions (e.g., less independent; Stephens, Fryberg, et al., 2012; Tibbetts et al., 2018). Therefore, these cultures may enable first-generation students to experience less of a cultural mismatch in these environments, and, in turn, be more comfortable and empowered to seek out resources. Since these types of psychological barriers have been shown to fuel social class achievement gaps in academic performance, confronting fewer of them might mean that there is less room for difference-education to improve first-generation students' experiences and outcomes.

Moreover, consistent with this theorizing, but not discussed in our preregistration, these lower levels of cultural mismatch might translate into a greater *comfort with social group difference*. For example, if students feel that the college environment is more consistent with their cultural backgrounds, they may feel more comfortable interacting with and navigating these environments. Likewise, the idea of interacting with others who are different might also seem more comfortable. If this is the case, this may suggest that there is less room for difference-education to improve students' *comfort with social group difference*.

In sum, difference-education may not benefit first-generation students at lower-resourced institutions either because (a) greater structural barriers interfere with their ability to benefit from increased empowerment or (b) fewer of the psychological barriers that difference-education addresses (e.g., lack of empowerment) means that there is less of an opportunity to improve their outcomes. Nevertheless, in our preregistration, we hypothesized that difference-education could still be effective in improving first-generation students' academic performance and *comfort with social group difference*.

Difference-Education Interventions Could Produce Benefits in Lower-Resourced Institutions

Despite the two above-mentioned reasons why difference-education interventions could be ineffective for first-generation students at lower-resourced institutions, we suggest that some benefits may nevertheless extend to these contexts. First, although greater structural barriers could lead difference-education interventions to be ineffective, we reason that there are still enough resources in lower-resourced contexts to render an increase in empowerment beneficial. For example, even without a formal tutoring center in lower-resourced institutions, students who feel empowered might still benefit from seeking out help from professors or from a local nonprofit that seeks to improve first-generation students' success.

Second, although first-generation students may confront fewer of the psychological barriers that difference-education is designed to address, initial research suggests that there is still an opportunity to positively impact their empowerment in lower-resourced institutions. Specifically, in a series of two studies in a minority serving, lower-resourced institution, Ramirez et al. (2021) examined whether an online intervention similar to difference-education improved

students' experiences and academic outcomes compared to a condition that presented only information on resources. The first study found that the condition similar to difference-education improved first-generation students' empowerment (i.e., interest in using resources) and grades compared to the resource only condition. However, the second study found no differences in these two outcomes across conditions (Ramirez et al., 2021).

Although the results across these studies are somewhat mixed, they suggest that students in lower-resourced institutions face significant psychological barriers that a social psychological intervention could address. As such, we reason that difference-education has the potential to positively impact first-generation students' experiences and academic outcomes in these settings. Therefore, as stated in our preregistration, we hypothesize that the academic performance benefits of difference-education interventions will extend to lower-resourced institutions, and that these benefits will be due to increased empowerment.

Do Difference-Education Interventions Improve Comfort With Social Group Difference in Lower-Resourced Institutions and Are They Unique in Their Ability to Do so?

We also expect that difference-education interventions will be effective in improving *comfort with social group difference* in lower-resourced institutions and that they will be unique in their ability to do so compared to other social–psychological interventions. As noted earlier, lower- versus higher-resourced institutions present greater structural barriers (e.g., fewer student support services) and fewer of the types of psychological barriers that difference-education is designed to address (e.g., less cultural mismatch). The additional structural barriers in these settings should not impact difference-education's ability to improve *comfort with social group difference*. Although, as explained above, less of a cultural mismatch may lead to greater comfort in college general and with social group difference in particular, students often feel high levels of discomfort when interacting with others who are different. Therefore, we still expect that students will have enough of an opportunity to improve their *comfort with social group difference*.

To answer the second question of whether difference-education interventions uniquely afford these benefits, it is necessary to compare difference-education to a similar social–psychological intervention that benefits first-generation students but does not provide a contextual theory of difference. In this case, we compare a difference-education intervention to a social-belonging intervention. These two interventions are well suited for comparison because they both address the types of psychological barriers that can undermine first-generation students (e.g., lack of fit or empowerment), but they do so by providing distinct lay theories. Given that difference-education interventions uniquely provide a contextual theory, we expect that a difference-education intervention will improve students' *comfort with social group difference* compared

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[3] Our preregistration also included exploratory hypotheses for the different types of institutions (i.e., community college vs. 4-year university). However, due to our smaller than expected sample of participants who engaged with the intervention materials, we were not able to compare students' outcomes by institution type.

to the control condition and social-belonging intervention. In contrast, we do not expect that a social-belonging intervention will improve *comfort with social group difference* compared to the control condition.

Social-Belonging Interventions

Like difference-education, a social-belonging intervention is a social–psychological intervention that changes students' lay theories or ways of making sense of their experiences (Walton & Cohen, 2007). In both higher- and lower-resourced institutions, social-belonging interventions have been shown to produce both psychological and academic benefits for students from structurally disadvantaged backgrounds—that is, students from underrepresented racial and ethnic minority groups and first-generation college students (Walton & Cohen, 2007, 2011; Walton et al., 2023).

In lower-resourced institutions, social-belonging interventions have been shown to improve structurally disadvantaged students' continuous enrollment and GPAs in the semester following the intervention (e.g., Murphy et al., 2020; Yeager et al., 2016). Social-belonging interventions tend to produce these academic benefits for students by increasing students' academic and social fit (e.g., Murphy et al., 2020), or their academic and social integration (e.g., Yeager et al., 2016)—an outcome conceptually similar to what we refer to as empowerment.[4] Building on this prior research, we similarly expect academic benefits among first-generation students to extend to lower-resourced institutions.

We did not preregister an a priori hypothesis regarding the mechanism through which the social-belonging intervention would improve first-generation students' academic performance in lower-resourced institutions. However, given previous results and theorizing about social-belonging interventions, our analyses test social fit and empowerment as potential mediators. See Section S1 in the online supplemental materials.

Although difference-education and social-belonging interventions have some similarities, they provide distinct lay theories (Covarrubias & Laiduc, 2022). Difference-education interventions teach participants why their experiences are different from each other (i.e., a contextual theory of social group difference). In contrast, social-belonging interventions teach participants that their challenges are similar or shared in common with other students. Walton and Cohen (2007) described the learning as follows: "Students learned that hardship and doubt were unique neither to them nor to members of their racial group but rather were common to all first-year students regardless of race." Thus, when first-generation students confront a challenge, this lay theory can help them to understand that their experiences are normal and shared with other students. Given that a social-belonging intervention does not provide a contextual theory of difference, we do not expect it to improve students' *comfort with social group difference*.

In sum, and as noted in detail in our hypotheses below, we expect difference-education and social-belonging interventions to produce similar academic performance benefits for first-generation students in lower-resourced institutions. At the same time, we expect them to produce distinct benefits in terms of students' *comfort with social group difference*. As stated in our preregistration (https://osf.io/wfzbr/?view_only=ef615f4e50de4becb08f2121b15a3e86), we have the following two hypotheses:

Hypothesis 1: The academic benefits of difference-education and social-belonging will extend to lower-resourced institutions. Specifically, we predict that the academic performance of first-generation students will be better in the two intervention conditions (difference-education and social-belonging) compared to the control condition.

Hypothesis 1A: We expect that empowerment will function as a mediator of difference-education's benefits in lower-resourced institutions. Specifically, we predict that the academic performance benefits among first-generation students in the difference-education intervention will be mediated by increased empowerment.

Hypothesis 2: The benefits of difference-education on *comfort with social group difference*[5] will extend to lower-resourced institutions. Specifically, difference-education will uniquely have this impact, such that it will improve students' *comfort with social group difference* compared to the control condition and social-belonging intervention.[6]

Method

Participants and Procedure

Participants were recruited from four institutions of higher education. Given that prior difference-education studies have been conducted at one university at a time (i.e., two separate studies in two different institutions), including students from four different institutions in the current sample is a key strength of this study. These institutions can be considered a convenience sample because we gained access to them through connections in our social networks. At the same time, we also selected these universities specifically because they differed from the two sites where prior difference-education interventions were delivered.

To characterize these differences, we first identified key institutional features that could be important to the success of the intervention and then sought to determine which feature(s) best differentiated these four sites from prior sites. After comparing the sites based on a wide range of features (e.g., endowment, cost before and after financial aid, rank, student diversity), we found that the one key feature that consistently differentiated all four sites from prior sites was the amount of financial resources the institutions had at their disposal. Specifically, compared to the institutions where previous difference-education interventions were delivered, all four institutions in the current study have fewer financial resources to invest in students—based on lower endowments and cost of attendance before and after financial aid (see Section S2 in

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[4] This measure of academic and social integration (e.g., use of academic support services) is similar to what we describe as resource-seeking behavior, a key component of our measure of empowerment, which typically mediates the academic performance benefits of difference-education in higher-resourced institutions.

[5] The current article uses the newer term *comfort with social group difference* (Townsend et al., 2021), rather than the older term from our preregistration, *intergroup outcomes*. The term *comfort with social group difference* refers to the same set of measures that we conceptualized as intergroup outcomes in the preregistration.

[6] Our preregistration did not explicitly state that there would be no difference in *comfort with social group difference* between the social-belonging and control condition, but finding no difference is consistent with our theorizing that difference-education will have a unique effect.

the online supplemental materials).[7] Therefore, this convenience sample of institutions allows us to examine whether previously observed results of difference-education interventions extend to institutions with relatively fewer financial resources.

We kept the recruitment as similar as possible across the sites, but with slight variations, given university policies. Students at Institution 3 were recruited through a voluntary first-year university transition course. These students were asked to participate for extra credit in their course or a $10 gift card. For the remaining three sites, students were recruited via email. Institution 1 provided students' email addresses but would not provide their demographic information. We therefore emailed all incoming students at Institution 1 to ask them to complete a brief prescreen survey, including questions about their generation status, gender, race or ethnicity, year in school, and whether they were born in the United States. We then used this prescreen survey data to determine students' eligibility for the study. For the remaining two institutions (i.e., 2 and 4), the registrar's office provided first year students' email addresses and demographic information (e.g., generation status, gender, race). After obtaining this information for all three sites, we invited students from these three universities via email to participate in the study in exchange for up to $20. As with previous interventions, we described the study as an opportunity to (a) learn from the experiences of successful, senior peers at their university and (b) provide input on the materials that our research team was developing for incoming students at their university.

In the first few weeks of the fall term (Time 1), participants were randomly assigned to complete one of the three conditions (difference-education, social-belonging, or control). After completing the materials, they then answered a series of questions about their anticipated experiences and behaviors in college and demographic information. At the end of the spring term (Time 2), participants completed a second follow-up survey to assess their end-of-year outcomes. They received a $10 gift card for each of the two surveys.

Based on our power analysis, our goal was to recruit 400 participants at each school, with a comparable number of first- and continuing-generation students at each university. We based this power analysis on the effect size for the interaction effect on grades that we observed in our previous online difference-education intervention ($\eta_p^2 = .042$). Assuming a small to medium effect, if the study were powered at 90%, we would need a sample of 307 participants at each university. However, given that only about 80% of participants in our previous research completed Time 2 end-of-year surveys, we rounded up to a target of 400 to allow for attrition. We recruited as many students as we could at each school (up to the goal of 400) and achieved a sample of 1,249 students across the four locations. For the three sites where students were recruited via email, we recruited as many first-generation students as possible and did our best to match the number and demographics (i.e., race, gender) of continuing-generation students to the first-generation group.

Constraints on Generality

As noted above, one key goal of the study was to extend prior studies of difference-education to lower-resourced institutions, and also to compare difference-education to social-belonging interventions in these institutions. We therefore recruited a convenience sample of first- and continuing-generation students at four institutions that had fewer financial resources than prior sites where difference-education interventions have been delivered. Although

this sample is appropriate for answering our research question, it is by no means a representative sample of students nor institutions. Therefore, the results should be interpreted with an understanding that they may be specific to these types of institutions, rather than generalizable to all first-generation students or universities.

Transparency and Openness

Because the dataset contains sensitive information from the universities' registrar's offices (e.g., participants' gender, race, social class, grades), it cannot be deidentified in a way that would both preserve participants' anonymity and make them useful for other scholars' reanalysis. As such, we can only make data available under a data sharing agreement approved by the relevant Institutional Review Board(s). Full study materials will be made available upon request.

Random Assignment to Condition

Among the 1,249 participants recruited, there were 411 participants randomly assigned to the difference-education intervention, 409 to the social-belonging intervention, and 429 to the control condition. We conducted a series of chi-square analyses to ensure that participants did not differ across the three conditions based on any of the following six demographic factors (i.e., race, gender, generation status, receipt of a Pell Grant, high school GPA, and SAT/American College Test [ACT] scores). We found no differences in any of these factors across the three conditions. See Section S3 in the online supplemental materials for the results of these analyses and the distribution of participant demographics across the three conditions and across the four intervention sites.

Protocol Compliance Check

A common issue in randomized control trials in real-world settings is that participants do not always follow the instructions—that is, they do not always comply with the research protocol (Gupta, 2011). In the present research, we considered participants as "complying" with the research protocol if they read the intervention materials for enough time to receive the intervention treatment. Unexpectedly, suggesting there was less compliance in the present research than in prior studies, participants in this study spent far less time reading the intervention materials (i.e., mean time spent = 4.8 min; median time spent = 3.1 min) than in the most comparable previous online difference-education intervention (i.e., mean time spent = 6.7 min; median time spent = 4.5 min).[8] Given the relatively small amount of time spent on materials, we were concerned that some noncompliant participants (i.e., those who fell substantially below the mean and/or median in terms of time spent) who were assigned to receive the intervention treatment did not actually receive the treatment.

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[7] Given one university in our sample (Institution 1) was relatively higher-resourced than the other three, we examined whether results differed between the universities based on their relative amount of resources (i.e., moderately-resourced university vs. lower-resourced universities). We found no evidence of moderation based on this variation (see Section S2 in the online supplemental materials).

[8] These numbers for the previous research exclude two outliers who spent a very long time (e.g., days) reading the stories and thus skewed the data. When including these outliers, the mean time spent was 59.6 min and the median time spent was 4.6 min.

To address this issue, we used a standard "per-protocol" approach to estimate the effects of the interventions (Gupta, 2011; Tripepi et al., 2020). Using this approach, we report the results of analyses using only the outcomes of students who complied with the research protocol.[9] We used the amount of time that participants spent on study materials as our criterion to indicate compliance, and we expected that students would have to spend at least 1 min on the materials to have a chance of receiving the key messages conveyed in the intervention treatment.[10] We opted to use time spent to indicate compliance because it was a relatively lenient measure compared to other possible indicators, such as a self-report item of whether participants paid attention or whether participants endorsed the intervention message. We chose this measure so that we could retain any participants who could have been influenced by the manipulation, even if they did not agree with the message or report paying attention to it.

Because students in the control condition were also required to read materials, we were able to apply this same selection criterion to both of the intervention conditions and the control. Accordingly, the rest of the analyses in this article report data only from these 962 participants who spent at least 1 min reading the stories and exclude the remaining 287 students who spent less than 1 min. We did not administer the Time 2 survey to the participants who spent less than 1 min. Importantly, the decision to rely on 1 min as the criterion for compliance was preregistered and made before we collected or analyzed our end-of-year data.

Examination of participants' manipulation check data supports the use of this criterion of 1 min. Compared to students who spent 1 min or more on the intervention materials, those who spent less than 1 min were less likely to accurately identify the specific intervention messages (difference-education, $b = -1.73$, $t = -2.98$, $p = .003$, $d = 0.47$; social-belonging, $b = -1.57$, $t = -4.42$, $p < .001$, $d = 0.49$); less likely to relate to the stories, $b = -0.54$, $t = -5.38$, $p < .001$, $d = 0.41$; and less likely to report paying attention to the materials, $OR = .07$, $z = -8.41$, $p < .001$.

Compliance Differences by Condition and Student Characteristics. Using the criterion of spending at least 1 min, we next examined whether compliance with the research protocol differed by condition or by other student characteristics. As shown in Section S5, Table S11 in the online supplemental materials, participants were less likely to comply with the protocol if they were male or if they had lower high school GPAs and SAT/ACT scores. They were also less likely to comply with the protocol in the social-belonging intervention compared to the difference-education intervention or control condition.

Given the different rates of compliance, we conducted additional analyses to examine whether these exclusions led to differences across conditions on the six key demographic factors we examined above (i.e., gender, race, generation status, receipt of a Pell Grant, high school GPA, and SAT/ACT scores). These analyses showed that, although participants who did not comply were different from those who did (i.e., based on gender, grades, SAT scores, and social-belonging condition), the participants who complied in each of the three conditions still did not systematically differ from each other based on these six demographic factors (i.e., gender, race, generation status, receipt of a Pell Grant, high school GPA, and SAT/ACT scores). In other words, participants across the three conditions were still similar based on these six demographic factors (see Table S12 in the online supplemental materials).[11] Nonetheless, given that more participants

were excluded from the social-belonging intervention ($n = 146$) than the difference-education intervention ($n = 70$) and control condition ($n = 71$), it is important to interpret the results from the social-belonging condition with caution.

Additional Exclusions and Final Sample Characteristics. Excluding participants who spent less than 1 min on the intervention materials yielded a sample of 962 participants. From this sample, we also excluded participants who did not fully complete the survey measures (i.e., failed attention checks and did not provide a summary of the key message of the intervention materials; $n_{T1} = 30$). This yielded a sample of 932 participants at Time 1. This was the population with whom we followed up for the Time 2 survey. Of these participants, 701 completed the survey at Time 2 for a 75% response rate.[12] From all analyses reported in this article, we also excluded participants who were not enrolled in the spring term and consequently did not have complete GPA information ($n_{T1} = 39$, $n_{T2} = 33$). After excluding these participants, participants across the three conditions were still similar based on the six demographic factors noted above.

This yielded a final sample of 893 participants at Time 1 and 666 participants at Time 2.[13] Given our reduced sample size, we did not have enough statistical power to look at each intervention site separately. We therefore combined the samples across the four intervention sites. Considering our expected effect size ($\eta_p^2 = .042$), this yielded a more than adequate level of power for our analysis (99% power at Time 1 and 98% power at Time 2).

The mean age of the sample was 19.25 years ($SD = 4.83$) at Time 1 and 18.88 years ($SD = 3.65$) at Time 2. The sample at Time 1 included 452 first-generation college students, 433 continuing-generation college students, and eight students who did not report their generation status; 49% White students, 28% Asian students, 6% Black students, 21% Latinx students, 1% Native American students, 2% Middle-Eastern or North African students, and 2% students

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[9] We also calculated effects using an "intent-to-treat" approach, which included all participants in the analyses. The per protocol and intent-to-treat approaches show similar results for students' GPAs. See Section S4 in the online supplemental materials.

[10] The intervention materials (i.e., the stories) were approximately 1,371 words on average across conditions. Since the average adult reads 228 words per minute (Trauzettel-Klosinski & Dietz, 2012; see also Rayner, 1998), it would take an average of 6 min to read all the stories. The median amount of time participants spent reading the intervention materials was 3.1 min. We reasoned, however, that participants only had to read a few stories to receive the message of the interventions. This lenient cutoff provides a conservative test of our hypotheses, as the intervention benefits should be less likely to occur among participants who spent relatively less time reading the stories. Our results were robust to different choices of cutoff criteria (i.e., at least 10, 20, or 30 s on two stories; at least 10, 20, or 30 s on three stories; at least 10 s on each story).

[11] We additionally tested whether there were significant differences in demographic variables and baseline academic performance (i.e., high school GPA and SAT/ACT scores) by condition among the students who were excluded from the sample. Table S13 in the online supplemental materials shows the results of these analyses.

[12] Two participants were mistakenly included in the follow-up: one participant who failed the attention check and one who took less than 60 s on the intervention materials. Both participants were excluded from the Time 2 survey.

[13] At Time 1, there were 148 from Institution 4; 444 participants from Institution 1; 62 from Institution 3; and 239 from Institution 2. At Time 2, there were 93 from Institution 4; 352 participants from Institution 1; 36 from Institution 3; and 185 from Institution 2.

of an unidentified race/ethnicity[14]; 32% men, 66% women, 1% gender-nonconforming students and 1% students who did not disclose their gender identity. The composition of the sample did not change significantly on these dimensions from Time 1 to Time 2, $ps > .37$. Forty-two percent of students were low income (based on receipt of Pell Grants). Low-income status was far more represented among first-generation students (63.4%) than continuing-generation students (19.3%). See Section S3 in the online supplemental materials for additional information about students' eligibility for Pell Grants by generation status across the four intervention sites.

Intervention Materials

In this study, we sought to balance the competing concerns of (a) adapting the intervention materials to the new contexts to ensure their relevance and (b) ensuring that we still convey the core message of each intervention so that we are able to compare the results of this study to prior intervention studies in other settings.

To adapt the stories used in prior interventions, the first step was to ensure that the stories represented the diversity of the student body at these lower-resourced institutions as best as possible. We therefore adapted the demographics of the students featured in the stories. Specifically, with stories used in prior higher-resourced institutions (Townsend et al., 2019), two of five stories were from first-generation students. However, in this study, we added two first-generation stories so that four of six stories were from first-generation students. We also adapted the racial composition of the pictures that accompanied the stories to ensure that the racial and ethnic composition of these pictures was roughly proportional to the student body at each school.

Beyond mirroring the demographic representation of students, the second step was to adapt the content of the stories from all three conditions (difference-education, social-belonging, and control) to each of the four local sites. To do so, we conducted a series of in-depth, structured interviews at each site with both first- and continuing-generation students.[15] These interviews enabled us to determine how and to what degree the stories needed to be revised. Based on these interviews, we determined that the stories used in prior intervention studies were largely relevant in these new sites. Therefore, the changes made to the stories were mostly small, surface-level details in the following two areas: logistical details and thematic content.

First, the interviews revealed logistical details that were specific to each site (specific names of clubs and organizations, such as "Criminal Justice Club"; activities on each campus, such as hanging with friends; and locations, such as spending time at the student center). We, therefore, made minor adjustments to these story details for each intervention site. Second, we considered the themes conveyed in the stories. The interviews revealed that the themes from prior interventions were quite similar to the ones spontaneously mentioned by students in these new settings. We therefore kept most of the themes consistent with prior materials (e.g., overcoming adversity and having a hard time talking to one's family about the college experience). However, as noted above, we added two new stories from first-generation students, and these new stories addressed the following themes: the importance of seeking a community and learning to be resourceful.

In each of the three conditions, participants first read six stories[16] that were ostensibly told by senior, successful students at that university. A picture of a student (three women and three men), and written text (i.e.,

student's name and college major) accompanied each story. The written labels did not include generation status, race, or gender. However, the pictures subtly conveyed race and gender. Through these pictures, we balanced the stories in terms of the students' gender and race. At least two of the six students were portrayed as White, and at least one was Latinx, East Asian, and Black. Generation status was conveyed through the text of the stories in the difference-education intervention as described below. We sought to ensure that the six stories were similar length across conditions: On average, the stories were 239 words in the difference-education intervention, 213 words in the social-belonging intervention, and 234 words in the control condition.

Difference-Education Stories

As noted above, the goal of the difference-education stories was to convey a contextual theory. The intervention materials we used in this study were similar to the online materials used by Townsend et al. (2019), which conveyed a contextual theory using the contrasting stories of college students from diverse social class backgrounds. Although difference-education interventions could be adapted to reduce disparities among other social groups (e.g., race/ethnicity, gender), prior studies and the current study have focused on reducing social class achievement gaps. Accordingly, these stories were designed to show how students' social class backgrounds could shape their experiences in college in both positive and negative ways. Specifically, each story typically began by mentioning students' social class backgrounds before college, such as having parents with 4-year college degrees (continuing-generation) or having parents without 4-year college degrees (first-generation). Students' stories then linked their particular backgrounds to their experiences in college—both in terms of challenges and strengths. After describing a challenge or a strength, the story then described some lessons that the student learned—for example, how the student overcame a challenge or leveraged a strength. The stories of first-generation students were interspersed and contrasted with those of continuing-generation students, who had their own set of background-specific challenges and strategies for success. Table 1 features key excerpts that illustrate the progression of stories for both first- and continuing-generation students.

Social-Belonging Stories

The goal of the social-belonging intervention was to convey that the challenges participants experience in college are shared in

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[14] These numbers do not add up to 100% because participants could select more than one race or ethnicity.

[15] We conducted three to four interviews with a diverse range of students at each of the four intervention sites (total of 14 interviews). The interviews consisted of a series of 13 general questions that sought to elicit general obstacles and views that were relevant at each school (e.g., "What was the college transition like for you?"; "What does belonging mean to you?") and 14 more specific logistical questions that focused on ensuring that more specific story details were accurate and relevant (e.g., "Do students live away from or with their families?"; "How active are people with extracurriculars?"; "Can students attend school on a part-time status?"). See Section S6 in the online supplemental materials for the full interview protocol.

[16] Traditional social-belonging interventions use nine stories, whereas difference-education interventions have used five or six stories. To make the three conditions more comparable in length, we reduced the number of stories in the social-belonging condition to six.

Table 1

Excerpts From Student Stories in the Difference-Education Intervention

	Overcoming background-specific obstacles	Leveraging background-specific strengths
Continuing-generation	[after mentioning her mom went to college]: I went to a small school where I felt really comfortable and knew everyone. […] It was hard to get the personal attention and help that I needed from my professors. In my first year, I learned that if you want to get the most out of your experience, all it takes is some courage to e-mail a professor whose class is closed and ask, "Can I get into your class? I really want to take it." And nine times out of ten they'll say sure. It was hard to adjust to a new school at first, but I was able to figure it out.	For me, there was just sort of the expectation that I would go to college, because my mom had gone. Even though education was always a focus in my house, my mom also helped me to understand that college is about more than academics. What I've learned from her and from my experiences is that attending college is really about creating opportunities for yourself as well as really getting to know who you are and what you really like. It's important to try out some different classes before you commit to an area of study.
First-generation	I'm a first-generation college student, so my parents didn't really understand what college was gonna be like […] This created tension because, even though they try, they didn't relate to some of my experiences. I would call and tell them "I'm overwhelmed about midterms," and they'd just be like, "you just gotta study hard." […] Over time, I learned how to deal with this tension with my family. […] I learned that it was helpful to try to tell my family more about the things I did in college. […] Communicating with them about my experiences helped keep them involved in my life. And it helped me navigate my first year without feeling overwhelmed.	Ending up in college made me and my parents proud since my parents didn't have that opportunity. But as a business major, I felt overwhelmed with the expectations, and I felt like I didn't know as much as other students because they had better opportunities than I did in high school. I realized though that there are other students from backgrounds like mine, and I wasn't the only one that felt this way and that I could figure some of these things out along the way. […] I've been through a lot of adversity and that defines how I approach my life. It gives me a broader perspective that has made college a lot easier to tackle.

common with other students. To maintain the fidelity of the intervention, our materials were based on and quite similar to the materials in the "social-belonging intervention" guide provided by Walton et al. (2017). However, as noted above, they were also adapted to the new intervention context to ensure that they were still relevant and meaningful.

As with all social-belonging interventions, the stories did not focus on students' backgrounds nor their social group memberships (i.e., generation status, race, gender).[17] Each story began with a student mentioning a challenge or obstacle, which could be interpreted as a signal of not belonging. The stories then concluded with a description of the student overcoming that obstacle and gaining a sense of belonging. Table 2 features key excerpts that illustrate the students' progress toward gaining a sense of belonging.

Control Stories

The goal of the control condition was to mirror the content (i.e., challenges, strengths, and strategies for success) of the difference-education intervention as closely as possible, but without providing a contextual theory of difference. The main difference between the difference-education and control condition was that the control condition did not link students' backgrounds to their current experiences in college (adapted from Townsend et al., 2019). The control condition also differed from the social-belonging intervention in that it did not talk about belonging. Notably, because this control condition mentions academic challenges and how to overcome them, it could also have some benefits for students. Each story began with a student describing a challenge (e.g., finding the transition to college hard). The stories then described how the student overcame that challenge (e.g., visiting a tutoring center on campus; Table 3).

Academic Performance

At the end of the first year, we obtained students' official grades from the university registrar at each school. We examined whether

students' mean GPAs were higher in the intervention conditions compared to the control condition.

Postintervention Surveys

We conducted two surveys after the intervention. The first survey (Time 1) was administered in conjunction with the intervention. Participants completed it immediately after reading the intervention materials. The primary purpose of this survey was to capture participants' attention to, perceptions of, and reactions to the intervention message. This survey contained (a) questions designed to encourage participants to internalize the intervention message, (b) manipulation checks, and (c) various measures to capture feelings of empowerment (as a potential mediator)[18] and experience of *comfort with social group difference*.[19]

The second survey (Time 2) occurred a few weeks before the end of the students' first year. The primary purpose of the Time 2 survey was to test the hypothesized effects of the intervention conditions

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[17] Unlike difference-education interventions, social-belonging interventions are broadly relevant to structurally disadvantaged students (i.e., both first-generation students and racial/ethnic minority students) and have been tested with these groups combined together. The goal of our study was to test whether social-belonging interventions would reduce the social class achievement gap in lower-resourced institutions. We therefore focused our recruitment efforts and analyses on testing this specific hypothesis with regards to social class.

[18] We also measured social fit as a potential mediator. The measure of social fit is reported in Section S7 and analyses of this measure are reported in Section S1 in the online supplemental materials.

[19] In addition to the measures reported here, we also measured perceived diversity, appreciation of differences in the university, and self-construal overlap with family and friends from home. Perceived diversity and appreciation of differences captured students' perceptions of how their universities handle diversity, and thus, were conceptually distinct from the measures of *comfort with social group difference*. None of these measures yielded significant differences across conditions. Findings for these measures are reported in Section S8 in the online supplemental materials.

Table 2
Excerpts From Student Stories in the Social-Belonging Intervention

Lacking belonging	Finding belonging
The transition to college can be difficult, and it was for me. During my freshman year, I sometimes didn't know what I was doing. I made a lot of casual friends in my dorm and other places, and I avoided interacting with professors in class and office hours. I think I was intimidated by them. I got some low grades early on, which stressed me out, and sometimes I worried I wouldn't make close friends like I had in high school.	But these things all got better over time. I began to make friends through classes and lab and sophomore year I started to get involved in research with one of my professors. My grades also got better as I started working in study groups and asked for help from my teaching assistants. Now I am happier than I have ever been at [name of school]. It is really rewarding for me to feel like I belong in the academic community here.
When I got into [name of school], I was so excited about becoming a student at such a great place. But sometimes I also worried I might be different from other [name of school] students. And when I got to campus, sometimes it felt like everyone else knew they were right for [name of school], but I wasn't sure if I fit in.	At some point, I realized that almost everyone feels different than everybody else, when really in at least some ways we are all pretty similar. Since I realized that, my experience at [name of school] has been almost one-hundred percent positive.

over time. With the exception of measures that were specific to Time 1 (noted below), the two surveys contained nearly identical measures of empowerment and *comfort with social group difference*. The only difference was that Time 1 measures asked students to report on anticipated experiences in the next year, whereas the Time 2 measures asked students to reflect on their experiences during the previous year. See Section S7 in the online supplemental materials for a complete list of Time 1 and Time 2 measures.

Measures Specific to Time 1

Internalizing the Message

After reading intervention materials, participants responded to questions designed to encourage them to attend to and retain the intervention messages (Yeager & Walton, 2011). In the difference-education and control conditions, we used questions that were similar to those used in previous difference-education interventions. Students first summarized three key messages from the stories and then answered three open-ended questions (e.g., "Which stories resonate with you most and why?" See Section S7 in the online supplemental materials).

For the social-belonging intervention, we balanced the competing goals of (a) maintaining the fidelity of typical social-belonging materials used in prior interventions and (b) making the methods of the interventions in our study similar enough so that we could compare the impact of the different lay theories the two interventions delivered. First, to maintain the fidelity of the social-belonging intervention and ensure that it would be comparable to prior social-belonging interventions, we asked participants to write an essay about their college transition. This essay was drawn from various examples included in the social-belonging intervention guide (Walton et al., 2017). The essay asked participants to describe: (a) their worries about belonging, (b) how they overcame their worries, and (c) why these worries are common during the college transition. As in prior interventions, participants were told that their essays might be provided anonymously to "incoming students at [their school] in future years to help give them a better understanding of the transition to college" (see Section S7 in the online supplemental materials).

Second, to be able to compare the effects of the different lay theories, we also sought to create some consistency across our three conditions through the internalization questions. We, therefore, added four new questions for the social-belonging intervention that were similar to what we asked in the difference-education and control conditions, as we described above (e.g., "Which stories do you think resonate

the most with the typical experiences of students coming to [university]? Why?" See Section S7 in the online supplemental materials).

Manipulation Checks

To assess whether the difference-education intervention communicated a contextual theory of difference, participants indicated to what extent (1 = *not at all*, 7 = *a lot*) the stories communicated the following themes: "Students' backgrounds matter in college," "Students' backgrounds can lead to unique challenges in college," and "Students' backgrounds can help them to succeed in college" ($\alpha = .76$). To assess whether the social-belonging intervention communicated that challenges are similar or shared with other students and improve over time, participants indicated to what extent (1 = *not at all*, 7 = *a lot*) the stories communicated the following themes: "Students worry initially that they do not belong in college but come to feel at home in college with time," "No matter where students come from, they have the same experiences in college," and "When students face obstacles in college, things generally work out with time" ($\alpha = .60$).[20]

Moreover, to ensure that the interventions and control were equally engaging, students responded to the following three questions: "Overall, to what extent did the student stories reflect your own experiences?" (1 = *not at all*, 7 = *a lot*), "How similar were the student stories to your own?" (1 = *not at all*, 7 = *a lot*), and "Did you pay attention to the content of the student stories you read?" (1 = *yes*, 2 = *no*).

Measures at Time 1 and 2: Empowerment and Comfort With Social Group Difference

Empowerment

The only formal preregistered hypothesis about mediation was that empowerment would serve as a mediator for the academic

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[20] Social-belonging interventions have used a range of manipulation checks. For example, after the intervention, Yeager et al. (2016) assessed anticipated improvement in belonging by asking students how much they expect to belong "when they arrive" and "at the end of the sophomore year." As another example, Murphy et al. (2020) asked questions like the following: "At first, most people have concerns about belonging and fitting in at <school name>, but over time, those concerns get better." For our manipulation check, we created new items that helped us to capture the key differences in the lay theories conveyed by difference-education and social-belonging interventions (a relative focus on difference vs. similarity, respectively).

Table 3
Excerpts From Student Stories in the Control Condition

Facing challenges	Overcoming Challenges
The summer before freshman year I was so excited about coming to [name of school]. But I was anxious too—it's a big transition. For me the most difficult part was coming from a situation in which I knew every student in high school for the past 4 years to [name of school] where I didn't know one student yet. Once I got here, even though I met large numbers of people, I didn't have a small group of close friends.	At first sometimes I felt I had to work to find lab partners and people to be in study groups with. I was pretty homesick, and I had to remind myself that making close friends takes time. But over time, in classes, clubs, and social activities, I have met other people, some of whom are now just as close as my friends in high school were.
I had small, close-knit classes in high school, so before I came to [name of school] sometimes, I worried that it would be hard to adjust to the large, impersonal lectures in college. I worried I would not have a personal connection with my professors or receive help when I needed it. And it did take time to get used to the large lectures in college.	But with time I saw that, just because there were more students, the professors didn't care less about me or think of me as just another number. Once I figured this out, I began to take more initiative in going to office hours and meeting with professors. When I made the effort, I found that my professors became quite warm and were invested in me and in my doing well.

performance benefits of difference-education. We captured empowerment with two measures: learning empowerment and resource-seeking behavior. These measures have been theorized to reflect psychological and behavioral elements of empowerment, respectively (Stephens, Hamedani, & Townsend, 2019). Using a scale from 1 (*strongly disagree*) to 7 (*strongly agree*), we measured learning empowerment using seven items ($\alpha = .86$) assessing the extent to which students felt academically empowered (Midgley et al., 2000). A sample item was "I have the power to influence my college experience." Adapted from the campus-resource seeking scale used in Stephens et al. (2014), resource seeking included 12 resource-seeking actions ($\alpha = .86$) assessing students' frequency of seeking academic help. Students reported how many times a month they expected to engage in (T1) or had previously engaged (T2) in these actions. A sample item was "Email a professor to ask a question."

The preregistration also included an exploratory hypothesis that social fit may serve as a mediator for difference-education. This measure (Section S7) and analyses (Section S1) are therefore reported in in the online supplemental materials.

We did not have an a priori prediction for a mediator for the social-belonging intervention. However, in the online supplemental materials, we report analyses examining whether social fit or empowerment could help explain the intervention's benefits (see Section S1). To summarize these findings, neither empowerment nor social fit mediated the academic performance benefits for the difference-education or social-belonging intervention.

Comfort With Social Group Difference

To capture *comfort with social group difference*, we used five measures that assessed students' ease and/or willingness to engage within and across different social groups: intergroup comfort, bridging differences, intergroup warmth and respect, intragroup warmth and respect, and social class pride. For each of these five measures, we created composites. We then standardized each composite and averaged these five composites together to create an overall composite measure of *comfort with social group difference*. All analyses reported below use this overall composite measure.

Using a scale from 1 (*not comfortable at all*) to 7 (*very comfortable*), we measured intergroup comfort with four items ($\alpha = .89$). We created these to capture students' comfort interacting with others from different backgrounds. A sample item was "How comfortable would you be interacting with someone from a different social class background than you?"

Using a scale from 1 (*strongly disagree*) to 7 (*strongly agree*), we measured bridging differences with two items ($\alpha = .78$), assessing how motivated students were to engage with members of different social groups. A sample item was "In college, I look forward to learning about social groups different from my own" (Nagda et al., 2004; Nagda & Zúñiga, 2003).

Using a scale from 1 (*not at all*) to 7 (*very*), we measured intergroup warmth and respect with two items ($\alpha = .77$) adapted from existing measures of warmth toward different groups (e.g., Nosek & Hansen, 2008). We asked students (a) "how warmly…" and (b) "how much respect and admiration do you feel toward" people who are members of a different social class. Students indicated their warmth and respect for multiple social class groups. For first-generation students, we used their feelings toward people who are "wealthy/upper class" as the measure of intergroup warmth and respect. For continuing-generation students, we used their feelings toward people who are "low-income/working-class" to indicate intergroup warmth and respect.

The measure of intragroup warmth and respect was identical to the measure of intergroup warmth and respect measure except that the former measure focused on students' evaluations of their own groups instead of outgroups ($\alpha = .81$). For first-generation students, we used their feelings toward people who are "low-income/working-class" to capture intragroup warmth and respect.[21] For continuing-generation students, we used their feelings toward people who are "wealthy/upper class" to capture intragroup warmth and respect. Given that both first- and continuing-generation students may identify as middle-class, we also asked students to report warmth and respect toward people who are middle-income/middle-class. Although we report results without including feelings of warmth and respect for middle-income/middle-class groups, results for both first- and continuing-generation students do not change when these feelings are included.

Using a scale from 1 (*strongly disagree*) to 7 (*strongly agree*), we measured social class pride with three items ($\alpha = .76$; Phinney,

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[21] The majority of first-generation students (63.4%) were also low-income (based on Pell Grant status). Therefore, this intragroup measure is broadly relevant to first-generation students—either on the basis of identifying as working class or as low income.

1992) assessing pride toward one's social class background. A sample item was "I feel good about my social class background."

Results

Manipulation Checks

Manipulation checks revealed that the two intervention conditions effectively communicated their intended messages compared to each other and the control condition. Overall, using the items described above, participants rated the difference-education intervention ($M = 5.49$) as communicating a contextual theory of difference more than the social-belonging intervention ($M = 4.69$), $b = 0.80$, $t = 7.72$, $p < .001$, $d = 0.64$, and control condition ($M = 4.72$), $b = 0.76$, $t = 8.17$, $p < .001$, $d = 0.61$. Participants rated the social-belonging intervention ($M = 5.34$) as communicating that students have similar or shared challenges more than the difference-education intervention ($M = 4.77$), $b = 0.57$, $t = 6.61$, $p < .001$, $d = 0.54$, and control condition ($M = 4.53$), $b = 0.81$, $t = 9.63$, $p < .001$, $d = 0.64$.

Across the three conditions, participants were comparably engaged with the intervention materials. Specifically, participants across conditions were equally likely to report paying attention to the materials, $\chi^2 = 2.78$, $p = .25$. They also did not differ in the degree to which they reported that the stories in each condition reflected their own experiences, $F(2, 879) = .26$, $p = .77$, or were similar to their own experiences, $F(2, 879) = .03$, $p = .97$.

Does Difference-Education Improve First-Generation Students' Academic Performance in Lower-Resourced Institutions, and Does It Do so by Increasing Their Empowerment?

Academic Performance

We hypothesized that the academic performance benefits of difference-education and social-belonging interventions would extend to lower-resourced institutions: In particular, that the academic performance of first-generation students would be better in the two intervention conditions (difference-education and social-belonging) compared to the control condition.[22]

Cumulative GPA. To examine the effects of intervention condition on cumulative GPA, we tested a linear regression model in which GPA was predicted by intervention condition (difference-education vs. social-belonging vs. control), generation status (first-generation vs. continuing-generation), and the interaction between intervention condition and generation status. GPA scores were standardized within schools so that scores reflected academic performance relative to other students at the same school.[23]

Consistent with previous difference-education studies (Stephens et al., 2014; Townsend et al., 2019) and to ensure that the academic performance effects were due to the intervention, rather than demographic characteristics, we controlled for race and ethnicity ($-1 =$ disadvantaged, $1 =$ advantaged), gender ($-1 =$ male, $1 =$ female), high school GPA, SAT/ACT scores, and whether participants were low-income based on Pell Grant status ($-1 =$ does not receive Pell Grants, $1 =$ receives Pell Grants). In addition, we also included a covariate for each of the four institutions included in the sample.[24] For the sake of consistency, we used this same standard set of covariates for all analyses in this article.

To examine the effects of the intervention condition for first-generation students, we conducted planned contrasts in which we dummy coded generation status (first-generation = 0, continuing-generation = 1) and intervention condition (difference-education vs. control: difference-education = 1, social-belonging = 0, control = 0; social-belonging vs. control: difference-education = 0, social-belonging = 1, control = 0). This allowed us to examine the simple effect for first-generation students in (a) the difference-education intervention versus the control and (b) the social-belonging intervention versus the control. To examine the effects of the intervention condition for continuing-generation students, we recoded the dummy coding of generation status (first-generation = 1, continuing-generation = 0). To determine whether the effects of the intervention condition were significantly different for first-generation versus continuing-generation students, we used a univariate analysis of variance to test the interaction effect in the regression model controlling for the standard set of covariates. A full report of statistics for these regression models (including descriptive statistics and the models without covariates) can be found in Section S9 in the online supplemental materials.

Hypothesis 1 predicted that the academic performance benefits of the difference-education and the social-belonging interventions would extend to lower-resourced institutions. Our analyses revealed that first-generation students in both intervention conditions had higher GPAs than first-generation students in the control condition, this difference did not reach significance for difference-education, $b = 0.12$, $t = 1.27$, $p = .21$, $d = 0.12$, and was only marginally significant for social-belonging, $b = 0.19$, $t = 1.76$, $p = .08$, $d = 0.18$. There were also no differences for continuing-generation students in the difference-education intervention versus the control, $b = 0.03$, $t = 0.31$, $p = .75$, $d = 0.04$, or in the social-belonging intervention versus the control, $b = -0.04$, $t = -0.36$, $p = .72$, $d = 0.05$. Consequently, the interaction between intervention condition and generation status was not significant, $F(2, 843) = 1.13$, $p = .32$, $\eta_p^2 = .003$.[25]

To further understand these null effects, we examined students' GPAs by academic term. To so do, we entered time (i.e., academic term) into our model as an interactive effect.[26] We found a

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[22] We could not include analyses of dropout in this study for two reasons. First, the rates of dropout were very low in three of four sites. Second, in the site with the highest rates of missing students (i.e., the community college), we could not distinguish between students who had dropped out and those who had transferred to another institution.

[23] Results were identical when analyzing scores that were not standardized within school.

[24] An alternative approach to analyzing this data is to conduct multilevel models with school assigned as an intercept-only random effect. However, because outcomes were standardized within schools, there was minimal variation in the intercept of each outcome across schools. Consequently, the results from these multilevel models were largely identical to the models we reported.

[25] The degrees of freedom vary across analyses because the amount of missing data varied across variables. For each analysis, we ran the fullest possible model given data available.

[26] To look at the interaction between intervention condition and term, we simultaneously examined each student's fall and spring GPA score. We then used a linear mixed model and assigned student as a random effect to account for the dependency between fall and spring GPAs. Degrees of freedom and p-values were estimated using the Satterthwaite approximation (Luke, 2017). Some schools were on the quarter system and therefore had three quarters of GPA data: fall, winter, and spring. Since the winter and spring quarters covered a time frame similar to that covered by the spring semester, the spring term GPA included the combined GPA for both winter and spring quarters.

significant three-way interaction between intervention condition, generation status, and academic term on GPA, $\chi^2 = 8.13$, $p = .02$, suggesting that the effects of the interventions on first-generation versus continuing-generation students depended on the academic term. We therefore examined fall and spring GPAs in separate regression models.

GPA by Term. For the fall term, first-generation students in both the difference-education and social-belonging intervention had significantly higher GPAs than students in the control condition (see Figure 1); difference-education, $b = 0.22$, $t = 2.23$, $p = .03$, $d = 0.22$; social-belonging, $b = 0.38$, $t = 3.52$, $p < .001$, $d = 0.40$. However, continuing-generation students in the difference-education and social-belonging intervention did not differ from those in the control condition; difference-education, $b = 0.07$, $t = 0.66$, $p = .51$, $d = 0.08$; social-belonging, $b = -0.05$, $t = -0.42$, $p = .67$, $d = 0.04$. The interaction between intervention condition and generation status on fall term GPA was statistically significant, $F(2, 847) = 3.91$, $p = .02$, $\eta_p^2 = .01$.

For the spring term, first-generation students in the difference-education intervention and the social-belonging intervention did not significantly differ in GPA from students in the control condition; difference-education, $b = 0.06$, $t = 0.58$, $p = .56$, $d = 0.06$; social-belonging, $b = -0.02$, $t = -0.22$, $p = .83$, $d = 0.02$. Similarly, continuing-generation students in the difference-education and the social-belonging intervention did not differ from continuing-generation students in the control condition; difference-education, $b = 0.01$, $t = 0.07$, $p = .94$, $d = 0.01$; social-belonging, $b = -0.01$, $t = -0.06$, $p = .96$, $d = 0.00$. The interaction between intervention condition and generation status on spring term GPA was not significant, $F(2, 817) = 0.11$, $p = .90$, $\eta_p^2 = .00$.

To better understand how term (fall vs. spring) related to first- and continuing-generation students' GPAs, we examined the extent to which there were social class gaps in each term across the three study conditions. In the fall term, as expected, there was a significant GPA gap between first- and continuing-generation students in the control condition, $b = -0.29$, $t = -2.81$, $p = .005$, $d = 0.30$. The academic benefits of both the difference-education and social-belonging interventions consequently served to eliminate these gaps; difference-education, $b = -0.14$, $t = -1.31$, $p = .19$, $d = 0.15$; social-belonging, $b = 0.13$, $t = 1.04$, $p = .30$, $d = 0.14$.

Figure 1

Fall GPA Scores for First-Generation and Continuing-Generation Students in the Difference-Education Intervention, Social-Belonging Intervention, and Control Condition
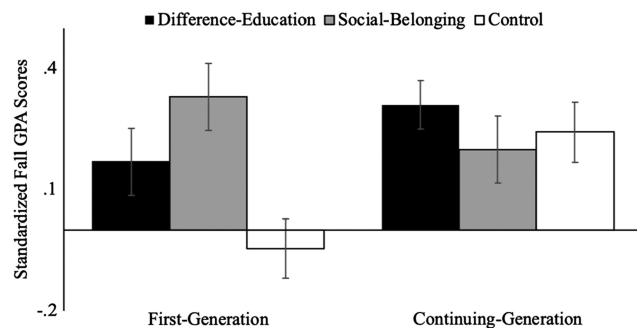
Note. Conditional means are displayed. Error bars represent ± 1 SE of the mean. GPA = grade-point average.

In the spring term, however, there was no evidence of a GPA gap between first- and continuing-generation students in any of the three conditions: control, $b = -0.17$, $t = -1.60$, $p = .11$, $d = 0.18$; difference-education, $b = -0.12$, $t = -1.08$, $p = .28$, $d = 0.13$; social-belonging, $b = -0.19$, $t = -1.45$, $p = .15$, $d = 0.20$. This finding is consistent with our theorizing from our preregistration that the academic performance benefits of difference-education interventions might not emerge in lower-resourced institutions if there are smaller social class gaps to reduce and less of an opportunity to improve first-generation students' performance. See Section S10 in the online supplemental materials for the inconclusive analyses exploring why we found significant effects in the fall versus spring term.

In sum, the results provide partial support for Hypothesis 1: The academic benefits of difference-education and social-belonging interventions extend to lower-resourced institutions. Specifically, for the results focused on the fall term (i.e., GPA), we found that first-generation students in the difference-education and social-belonging interventions had higher GPAs than first-generation students in the control condition.

These results suggest that the academic benefits of these two interventions do indeed extend to lower-resourced institutions. However, unlike higher-resourced institutions, these results do not persist beyond the fall term when the intervention was administered. This lack of academic performance benefits in the spring may have been because of the lack of a social class gap in academic performance in the spring term, which meant that there was less room for first-generation students to improve their academic performance. This finding is consistent with our theorizing in the preregistration that the interventions would only benefit students to the extent that the academic setting creates social class gaps in students' outcomes.

Empowerment as a Mediator of Difference-Education

Hypothesis 1A predicted that difference-education interventions would improve first-generation students' academic performance in lower-resourced institutions by increasing their empowerment. To test this hypothesis, we first examined whether students in the difference-education intervention reported higher values on two measurements of empowerment (i.e., learning empowerment, resource seeking) at both Time 1 and Time 2. Specifically, we tested two regression models for each respective outcome with model predictors, standard covariates, and planned contrasts identical to our analyses of GPA. Given that our preregistered hypothesis only pertained to empowerment as a mediator of difference-education, we reported all additional exploratory mediation analyses for difference-education and social-belonging in Section S1 of the online supplemental materials. A full report of statistics for these regression models (including descriptive statistics and the models without covariates) can be found in Section S9 in the online supplemental materials.

We hypothesized that, for first-generation students, the difference-education intervention would lead to more empowerment (i.e., captured through measures of learning empowerment and resource-seeking) compared to the control. However, at Time 1, first-generation students in the difference-education intervention and control did not differ in their anticipated learning empowerment, $b = 0.08$, $t = 0.81$, $p = .42$, $d = 0.08$, nor resource seeking, $b = 0.10$, $t = 0.89$, $p = .38$, $d = 0.10$. Similarly, at Time 2, first-generation students in the difference-education intervention and control did not differ in their experiences of learning empowerment, $b = 0.02$, $t = $

0.16, $p = .88$, $d = 0.02$, nor resource seeking, $b = -0.08$, $t = -0.62$, $p = .53$, $d = 0.08$. The same pattern was evident for continuing-generation students: Those in the difference-education intervention and control did not differ in empowerment at Time 1 (learning empowerment, $b = -0.08$, $t = -0.77$, $p = .44$, $d = 0.09$; resource seeking, $b = 0.04$, $t = 0.39$, $p = .69$, $d = 0.04$) nor Time 2 (learning empowerment, $b = -0.19$, $t = -1.38$, $p = .17$, $d = 0.20$; resource seeking, $b = 0.04$, $t = 0.27$, $p = .79$, $d = 0.04$). Across Time 1 and Time 2, there were no significant interactions between the intervention condition and generation status for learning empowerment, Time 1, $F(2, 853) = 0.82$, $p = .44$, $\eta_p^2 = .002$, Time 2, $F(2, 638) = 0.78$, $p = .46$, $\eta_p^2 = .002$; nor resource seeking, Time 1, $F(2, 854) = 0.69$, $p = .50$, $\eta_p^2 = .002$, Time 2, $F(2, 638) = 0.21$, $p = .81$, $\eta_p^2 = .001$.

In our preregistration, we suggested that difference-education interventions might not improve empowerment if first-generation students in lower-resourced institutions faced fewer of the psychological barriers that difference-education is designed to address (e.g., a lack of empowerment). To explore whether this was the case, we conducted post hoc analyses comparing first- and continuing-generation students in the control condition on the two measures of empowerment. Using linear regression models and controlling for the standard set of covariates, at both Time 1 and Time 2, we found no differences between first- and continuing-generation students in either learning empowerment, Time 1, $b = -0.18$, $t = -1.64$, $p = .10$, $d = 0.20$, Time 2, $b = -0.22$, $t = -1.59$, $p = .11$, $d = 0.22$; or help seeking, Time 1, $b = -0.03$, $t = -0.29$, $p = .77$, $d = 0.03$, Time 2, $b = -0.05$, $t = -0.37$, $p = .71$, $d = 0.05$. In other words, in the absence of intervention, first-generation students did not feel less empowerment than their continuing-generation peers. This finding suggests that difference-education may not have improved first-generation students' empowerment because there was less room for the intervention to do so in these lower-resourced institutions.
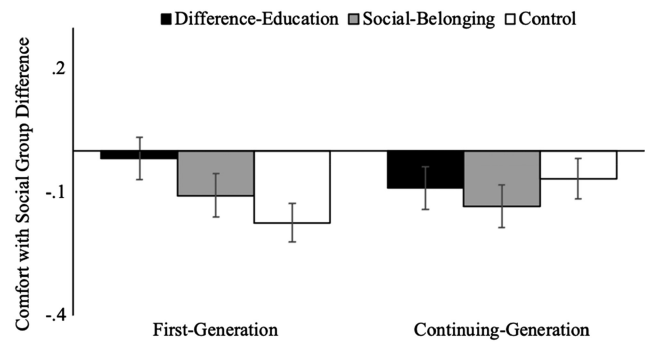
Do Difference-Education Interventions Improve Comfort With Social Group Difference in Lower-Resourced Institutions and Are They Unique in Their Ability to Do so?

Hypothesis 2 predicted that the benefits of difference-education interventions for *comfort with social group difference* would extend to lower-resourced institutions. In particular, we expected it would have unique effects, such that the difference-education intervention would improve students' *comfort with social group difference* compared to the control condition and social-belonging intervention. We did not expect that the social-belonging condition would differ from the control condition.

To test this hypothesis, we tested two regression models (at Time 1 and Time 2) for each outcome with model predictors and the standard set of covariates. Generation status was also dummy coded in a manner identical to our previous analyses. However, we dummy coded intervention condition to contrast difference-education versus the control (*difference-education = 0, social-belonging = 0, control = 1*) and difference-education versus social-belonging (*difference-education = 0, social-belonging = 1, control = 0*). A full report of statistics for these regression models (including descriptive statistics and the models without covariates) can be found in Section S9 of the online supplemental materials.

Figure 2

Mean of First- and Continuing-Generation Students' Comfort With Social Group Difference Across Conditions at Time 1

Note. Conditional means are displayed. Error bars represent ± 1 *SE* of the mean.

At Time 1, supporting Hypothesis 2, first-generation students in the difference-education intervention reported significantly more *comfort with social group difference* compared to those in the control condition, $b = 0.16$, $t = 2.35$, $p = .02$, $d = 0.23$ (see Figure 2). Contrary to Hypothesis 2, although the pattern was in the predicted direction, first-generation students in the difference-education intervention did not report more *comfort with social group difference* compared to the social-belonging intervention, $b = 0.09$, $t = 1.20$, $p = .23$, $d = 0.15$. Moreover, consistent with our expectations, first-generation students in the social-belonging intervention did not differ in *comfort with social group difference* compared to those in the control, $b = 0.07$, $t = 0.90$, $p = .37$, $d = 0.10$.[27] In contrast, continuing-generation students in the difference-education intervention did not report more *comfort with social group difference* than those in the control, $b = -0.02$, $t = -0.22$, $p = .83$, $d = 0.03$, or those in the social-belonging condition, $b = 0.04$, $t = 0.59$, $p = .55$, $d = 0.07$. The interaction between intervention condition and generation status did not reach statistical significance, $F(2, 854) = 1.20$, $p = .30$, $\eta_p^2 = .003$.

At Time 2, first-generation students in the difference-education intervention did not differ in their *comfort with social group difference* compared to those in the control condition, $b = 0.08$, $t = 1.00$, $p = .32$, $d = 0.13$, or social-belonging intervention, $b = -0.02$, $t = -0.21$, $p = .83$, $d = 0.03$. The same pattern was evident for continuing-generation students (difference-education vs. control, $b = -0.05$, $t = -0.61$, $p = .54$, $d = 0.08$; difference-education vs. social-belonging, $b = 0.07$, $t = 0.76$, $p = .45$, $d = 0.11$). The interaction between the intervention condition and generation status was not significant, $F(2, 639) = 1.94$, $p = .14$, $\eta_p^2 = .01$.

Discussion

Summary

The present research asked two key questions about whether the benefits of difference-education interventions extend to lower-

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[27] This contrast was not planned as part of our main analyses but was an additional contrast that we conducted to explore the differences between conditions (*social-belonging = 1; difference-education = 0; control = 0*).

resourced institutions. First, are difference-education interventions effective in improving first-generation students' academic performance in lower-resourced institutions, and do they do so by increasing their empowerment? Second, do difference-education interventions improve *comfort with social group difference* in lower-resourced institutions, and are they unique in their ability to do so? Across four institutions with fewer financial resources than sites where prior difference-education interventions were delivered, we found that some of the benefits extend to lower-resourced institutions, and some do not. Moreover, we found partial evidence that difference-education interventions uniquely improve *comfort with social group difference* compared to a social-belonging condition.

Hypothesis 1 predicted that the academic performance benefits of the difference-education and social-belonging interventions would extend to lower-resourced institutions. Supporting this hypothesis, we found that both interventions improved first-generation students' academic performance (i.e., GPAs) compared to the control condition. However, they only did so for the fall term of the first year (i.e., soon after the intervention) and did not persist through the spring term. These findings are consistent with a recent intervention inspired by difference-education, which found academic benefits for first-generation students only in the fall term but not in the spring (Ramirez et al., 2021).[28] Together, these findings show that difference-education interventions may have some benefits outside of the elite, higher-resourced institutions that prior studies have examined.

We hypothesized that the academic performance benefits of difference-education interventions among first-generation students would be due to an increase in empowerment. Contrary to this hypothesis, we found no evidence that this was the case. In previous studies in higher-resourced institutions, research found that empowerment (e.g., efficacy, resource-seeking; Stephens et al., 2014; Townsend et al., 2019) helped to explain how difference-education interventions produced academic performance benefits for first-generation students. However, in this study, the intervention did not improve first-generation students' empowerment, and thus did not play a mediating role. One possible reason why we did not find effects on empowerment is that a lack of empowerment—the type of psychological barrier that difference-education was designed to address—may be less likely to occur among first-generation students in lower-resourced compared to higher-resourced institutions. For example, as we explained in the introduction, the less elite cultures of lower-resourced institutions may lead first-generation students to feel less of a mismatch with the college environment and therefore more empowered to take advantage of the resources available to them. Our data supports this idea: In contrast to previous findings in higher-resourced institutions, in the control condition, we did not find the typical social class gap in empowerment.

Hypothesis 2 predicted that the benefits of difference-education interventions on *comfort with social group difference* would extend to lower-resourced institutions and that difference-education would uniquely improve this outcome compared to a social-belonging intervention. Supporting this hypothesis, we found that the difference-education intervention, but not the social-belonging intervention, significantly improved *comfort with social group difference* compared to the control condition. The social-belonging intervention did trend toward increasing *comfort with social group difference* relative to the control, but this effect was

not statistically significant and was half the size of the effect of the difference-education intervention ($b = 0.16$ vs. $b = 0.07$). However, as with GPA, the difference-education intervention only improved this outcome for the fall term of the first year and did not persist through to the spring term. Altogether, these results provide partial evidence that the benefits of difference-education for *comfort with social group difference* extend to lower-resourced institutions.

Theoretical Contribution

The partial support we found for our hypotheses provides important theoretical insights about the potential to extend social–psychological interventions to lower-resourced institutions. The first phase of research on social–psychological interventions focused on establishing that these interventions can benefit students academically (Walton & Wilson, 2018). Now that the benefits of social–psychological interventions have been documented, in the second phase, it is critical to uncover the contextual factors that facilitate or hinder their efficacy (Binning & Browman, 2020; Bryan et al., 2021). The current study is the first to examine whether the previously observed benefits of difference-education interventions in higher-resourced institutions extend to institutions that have fewer resources. It is important to understand how effective these interventions are in lower-resourced institutions because these institutions are likely to have both more structural barriers and fewer psychological barriers compared to higher-resourced institutions. Examining difference-education in lower-resourced institutions can therefore help uncover how and to what extent these contextual factors impact the intervention's efficacy.

Our findings suggest that the context of the intervention (i.e., financial resources of the institution) matters. Consider the different effects that we found for academic performance and *comfort with social group difference* in higher-resourced compared to lower-resourced institutions. In higher-resourced institutions, previous research has found that the academic performance benefits of difference-education and social-belonging interventions persist throughout college (e.g., Townsend et al., 2021; Walton & Cohen, 2011). In contrast, in the current study, we found that in lower-resourced institutions, the academic performance effects did not persist beyond the first term. Likewise, a similar pattern emerged for difference-education's benefits for *comfort with social group difference*. In higher-resourced institutions, prior research has found that the intervention's effects on *comfort with social group difference* persist throughout college (e.g., Townsend et al., 2021). However, in this study, we again found that in lower-resourced institutions, these effects again did not persist beyond the first term.

These findings are theoretically important because they suggest that the benefits of difference-education and social-belonging interventions persist less in institutions with fewer resources than the sites where prior interventions have been delivered. To examine why this

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[28] A second study in this article found that first-generation students in the condition inspired by difference-education performed better academically in both the fall and spring terms compared to their untreated counterparts who were not a part of the study. However, given that the untreated students were not randomly assigned to a condition, we do not know whether these students' different outcomes were due to selection effects.

might be the case, we conducted exploratory analyses. As noted earlier and presented in the online supplemental materials, these results are largely inconclusive (see Section S10). We suggest that intervention "fade-out"—or the intervention effects fading over time—is one possible explanation for our findings (Bailey et al., 2017, 2020). We theorize that fade-out may be more likely to occur in lower-resourced compared to higher-resourced institutions because first-generation students face far more structural barriers (e.g., financial constraints) in these settings. To prevent fade-out, social–psychological interventions in lower-resourced institutions may need "booster" interventions to help maintain the message in the face of these structural barriers. Alternatively, social–psychological interventions in these contexts may be most likely to persist in their effectiveness when delivered in tandem with other types of structural interventions (e.g., providing money for meeting basic needs; see Stephens, Markus, & Fryberg, 2012).

Next, consider the different effects that we found for empowerment in higher-resourced compared to lower-resourced institutions. In higher-resourced institutions, previous research has found consistent evidence that first-generation students who participate in difference-education interventions improve their academic performance, in part, because the intervention increases their sense of empowerment. In lower-resourced institutions, on the other hand, we found no evidence of any empowerment benefits either immediately after the intervention or at the end of the first year. As noted in the discussion above, these results suggest that psychological barriers such as a lack of empowerment may play less of a role in these lower-resourced institutions.

Although these particular psychological barriers likely play a reduced role, our results suggest that psychological barriers of some form still play an important role. One might have theorized that structural barriers in lower-resourced institutions would be so significant that psychological interventions like difference-education or social-belonging would have no impact on students' academic outcomes. Yet, given that we found that both interventions provide some academic benefits in these settings, our results suggest that first-generation students are still likely to experience some psychological barriers that social psychological interventions can help them to overcome. For example, perhaps these interventions could help students to overcome different types of psychological obstacles in these lower-resourced institutions, such as stress due to financial concerns or limited opportunities.

Beyond the theoretical insights gleaned from the new intervention context, another theoretical advance is that this study is the first to directly compare the effects of a difference-education and a social-belonging intervention (for examples of other papers that compare two different interventions, see Paunesku et al., 2015; Yeager et al., 2016). By comparing two similar social–psychological interventions that provide distinct lay theories, we were able to examine whether providing a contextual theory of difference produces different outcomes than the lay theory conveyed by a social-belonging intervention. As a difference-education intervention—but not a social-belonging intervention—provides a contextual theory, we theorized that difference-education would improve students' *comfort with social group difference* more than the control condition and the social-belonging intervention. Our results provided some initial support for this hypothesis: At Time 1, the difference-education intervention—but not the social-belonging intervention—improved *comfort with social group difference* compared to the control condition. This suggests that the

content of the intervention's particular lay theory may indeed impact the intervention's effects on *comfort with social group difference*. However, the unique effects of difference-education on *comfort with social group difference* did not persist through the end of the year.

Limitations and Future Directions

One limitation of the current study is that we had a large number of participants (i.e., 287 of 1,249 [23.0%]) who spent less than 1 min reading the intervention materials. Given that we only analyzed the data of participants who spent at least 1 min on the materials (and successfully received the intervention), our analyses did not include the full sample. Instead, the analyses included only participants who complied with the protocol. Although we went to great lengths to rule out alternative explanations, this type of per protocol analysis is vulnerable to alternative causal explanations. Losing a significant portion of our sample also meant that we were not able to examine other possible moderators of the interventions' effects (e.g., full- or part-time student status). However, by considering the data across all four sites together, this sample size was over three times larger than any other difference-education study to date. Therefore, we still had an adequately powered sample size ($n_{T1} = 893$; $n_{T2} = 666$) to detect the overall effects of the interventions in lower-resourced institutions.

Based on previous studies in higher-resourced institutions, we did not anticipate that we would lose a significant portion of our sample. Indeed, in the most comparable previous difference-education intervention delivered online (Townsend et al., 2019), only 11 of the 133 (8.3%) participants spent less than 1 min engaging with the materials. Thus, compared to prior interventions in higher-resourced contexts, we found that participants in lower-resourced contexts spent less time engaging with the intervention materials. Although this finding was unexpected, it is an important contribution to the literature on intervention science, as it suggests that participants' engagement with intervention materials differs across institutional contexts.

Beyond the question of statistical power, we also suggest that results from the social-belonging intervention should be interpreted with caution. As noted earlier, one potential concern is that more participants were excluded from the social-belonging condition than from the other two conditions. Another concern is that the social-belonging condition was adapted slightly from prior social-belonging interventions to render it more methodologically comparable to the methods of the difference-education intervention (e.g., the internalization questions were not identical; there were six stories instead of nine). It is possible that the social-belonging intervention could have been even more effective if we had not adapted these materials. At the same time, the results were broadly consistent with the findings of Murphy et al. (2020), and, therefore, suggest that the effects of social-belonging interventions are robust to slight modifications that do not detract from the overall message.

Another potential concern is the impact of these exclusions on the representativeness of our sample. Most notably, students excluded from our sample seemed to have lower academic performance (e.g., lower high school GPAs and standardized test scores before college) than those included. As the intervention materials were not able to effectively engage these lower performing students, it is unclear whether the benefits of difference-education would extend to these students. Despite this potential limitation, the results are

important as they demonstrate that difference-education can benefit some students in lower-resourced institutions.

This unexpected finding—that is, that students engaged less with the intervention materials in lower-resourced (versus higher-resourced) institutions—also has important practical implications. Specifically, this finding suggests that researchers and practitioners may need to take additional steps (e.g., convey stories via video or on social media) to ensure that students in lower-resourced institutions more thoroughly attend to and engage with the intervention materials. Indeed, if students in lower-resourced institutions confront more structural constraints (e.g., less need-based financial support) than those in higher-resourced institutions, they may have additional demands on their time and interruptions (e.g., family to care for) that could limit their ability to focus on the intervention materials. Future research should explore this possibility and also examine strategies for creating higher levels of engagement with intervention materials in lower-resourced contexts.

Future research is also needed to compare the benefits of difference-education across different types of lower-resourced institutions, such as community colleges versus less selective state colleges. In this future work, it will be important to more precisely identify which contextual features impact the effectiveness of difference-education interventions. For example, research should consider the specific impact of other factors, such as an institution's level of socioeconomic diversity. It will also be critical to better understand how the institutional context shapes the mechanism through which difference-education interventions benefit students. For example, in lower-resourced settings, does a different type of empowerment play a mediating role, or does another process explain the intervention's benefits?

Finally, future research should more precisely identify the core components of difference-education that are necessary to create academic benefits. For instance, is it necessary for the intervention to describe both background-specific challenges and strengths to empower students to succeed? Research on strength-based approaches to intervention build on key insights from difference-education interventions by isolating one key component of their message: a focus on background-specific strengths (Bauer et al., 2021; Hernandez et al., 2021; Silverman et al., 2023). Unlike difference-education, these studies do not provide a broader contextual theory, nor do they help students understand the background-specific challenges they are likely to face. The results of these studies suggest that a focus on strengths may be sufficient for improving some academic experiences and outcomes among students (e.g., enhanced motivation and academic persistence). Nevertheless, an interesting question remains: What benefits are lost without a broader understanding of how contexts shape students' experiences in college?

Conclusion

Most first-generation students in the United States obtain higher education in lower-resourced institutions, yet this important context has been notably absent from the research on interventions designed to benefit them. This lack of understanding of lower-resourced college and university contexts may limit the development of theories of how interventions produce their benefits, as well as reduce our understanding of when such benefits are likely to occur. The present research asked whether difference-education interventions' two key benefits—academic performance and *comfort with social group difference*—extend to lower-resourced institutions. Overall, we found that difference-education interventions' benefits do indeed extend to lower-resourced institutions, but they are far more short-lived than in higher-resourced settings. This represents a significant theoretical advance in our understanding of how the context of an intervention can facilitate or hinder its impact. To date, most of the research on social–psychological interventions has shown that they can benefit students in important and lasting ways. In the next phase, researchers and practitioners must continue to move beyond these questions of whether they can work to more fully examine when and how these interventions work in different types of contexts.

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