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# Signaling Allyship via Antiracism

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# Signaling Allyship via Antiracism

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## Abstract

Black students face ongoing exclusion in Science, Technology, Engineering, and Math (STEM) classrooms. Expressing support for antiracism via a course syllabus may serve as one beneficial strategy to attract Black students to STEM settings; however, this possibility has yet to be explored. In the present study, Black participants viewed a hypothetical STEM professor's syllabus and we varied the race of the STEM professor and whether the professor's syllabus included an antiracism or general DEI statement. That is, Black participants were assigned to one of four conditions: Black professor-antiracism statement, Black professor- DEI statement, white professor-antiracism statement, or white professor-DEI statement and reported their anticipated belonging in the classroom as well as perceptions the professor was an ally. We found that when exposed to a Black professor, participants reported greater perceptions of allyship and belonging compared to those that viewed the white professor. Moreover, perceptions of allyship and belonging were greater when participants were presented with antiracist syllabus content compared to general DEI syllabus content. Overall, the Black professor paired with the antiracism statement promoted the highest level of allyship and belonging. At the same time, the white professor with the antiracism statement promoted greater belonging and allyship than the white professor with the general DEI statement, suggesting that antiracism may be particularly helpful for white STEM professors.

## Introduction

Black college students face historic and ongoing exclusion in science, technology, engineering, and mathematics (STEM) learning environments. Even though the demand for workers in STEM is high, the environment currently, and historically, lacks racial diversity (STEM; National Science Foundation [NSF], National Center for Science and Engineering Statistics, 2019). Lack of representation can trigger concerns one's identity is not valued in a particular environment (Murphy et al., 2007; Steele et al., 2002) resulting in Black students avoiding STEM classes and majors. Moreover, students of color often face discrimination and unwelcome environments in STEM. As one example, Black students face repeated racial microaggressions that may challenge their mental health and academic performance in engineering doctoral programs (Miles et al., 2020). Researchers attribute this to stereotypes and institutional climates that juxtapose their STEM and racial identities as incongruent (Miles et al., 2020). Challenges such as these are discouraging to Black students that have the desire to pursue an education or career in STEM. Black students are more likely to persist and remain in STEM majors and careers when an inclusive environment is fostered in STEM settings (Johnson et al., 2019; Johnson et al., 2020; Pietri et al., 2018; Pietri et al., 2020; Purdie-Vaughns et al., 2008). Consequently, identifying effective strategies to promote inclusive environments and attract Black students to STEM classrooms and majors is greatly needed.

In the present research, we examined a novel strategy to communicate an inclusive classroom environment for Black students in a STEM setting – signaling allyship via antiracism. *Allyship* is an explicit signal that indicates a person acts in support of a marginalized group (Ashburn-Nardo, 2018; Johnson et al., 2019), and critically, past work has found that perceiving a STEM professor as an ally is associated with greater belonging (i.e., feelings of inclusion) in STEM settings (Johnson et al., 2019). Despite the potential benefits of allyship in STEM spaces,

past work has yet to experimentally investigate effective strategies for STEM instructors to signal allyship. Consequently, in the present study, we examined the benefits of *antiracism*, which is the policy or practice of directly opposing racism and promoting racial equity in various environments (McGee, 2020; McGee, 2022).

In addition to examining the benefits of antiracism, we also manipulated the race of the STEM professor. Previous research suggests that an instructor with a shared racial identity promotes more belonging in Black students than a professor with an incongruent racial identity, (e.g., a white professor). For example, Pietri and colleagues (2018) found that Black women anticipated more trust and belonging when a Black woman was highlighted in a STEM company compared to when a white woman was highlighted. Likewise, increased access to Black professors is associated with greater belonging in STEM among Black students (Johnson et al., 2019). White professors comprise majority of STEM instructors (NSF, 2019). However, little work has examined how white instructors can cultivate inclusion for Black students, which is part of our goal in the current research. That is, in the present work, we also examined whether antiracism helped a white professor promote inclusion among Black individuals.

***Signaling identity safety via role models***

Black and other racial and ethnic minorities face unique challenges in STEM, contributing to their ongoing exclusion in STEM fields and careers. One useful theoretical framework for understanding Black individuals' underrepresentation in STEM settings is the *cues hypothesis* (Murphy et al., 2007). The cues hypothesis postulates that subtle, situational cues (e.g., mere underrepresentation) can trigger objective and subjective experiences of social identity threat among traditionally stereotyped groups, even if a setting exhibits no overt evidence of racial prejudice or discrimination (Murphy et al., 2007). The cues hypothesis argues

that a situational cue can lead to the experience of *social identity threat*, or concerns that one (or more) of an individual's social identities will be devalued in a setting (Murphy et al., 2007). Past work has shown seeing few members of your ingroup in STEM settings can trigger social identity threat concerns (Murphy et al., 2007). Thus, the cues hypothesis suggests that ongoing underrepresentation in STEM makes Black students particularly vulnerable to the experience of social identity threat.

Of importance to the present work, just as situational cues can trigger social identity threat, a wealth of work has highlighted that situational cues can also foster identity safety. *Identity safety* is the inverse of social identity threat, and is characterized as feeling as though one or more of an individual's social identities is valued in a given setting (Murphy et al., 2007; Pietri et al., 2019; Steele et al., 2002). Identity safety is associated with a variety of positive downstream consequences and can manifest as an increased sense of *belonging and trust* (i.e., feeling welcome and included in an environment; Johnson et al., 2019; Pietri et al., 2018), as well as greater *interest* or engagement in STEM (Johnson et al., 2022). Critically, individuals that report feelings of identity safety in STEM environments are more likely to persist in STEM, and ultimately enter the STEM workforce (Lewis et al., 2017). Thus, identifying strategies to foster identity safety for Black individuals is greatly needed to combat their underrepresentation in STEM.

Situational cues known as *identity safety cues*, or cues in one's environment signaling that one's identity is valued, offer one such potential strategy (Avery et al., 2004; Davies et al., 2005; Walton et al., 2015). Identity safety cues can take on a variety of formats, be embedded in various organizational environments, and critically, have been found to be an effective means to promote identity safety among minoritized persons (Kruk & Matsick, 2021). As one example, in

healthcare settings identity safety cues can take the form of racially and ethnically diverse physician clientele and/or pro-diversity statements provided by physicians (Cipollina et al., 2020). Likewise, gender pronouns have been found to be an effective identity safety cue among sexual and gender minorities (Johnson et al., 2021). Thus, the inclusion of identity safety cues in STEM classrooms maybe one effective strategy to promote identity safety and attract Black students to STEM.

One well-documented identity safety cue found to mitigate social identity threat concerns and foster identity safety is via exposure to a successful *role model*. A role model is someone who a person feels similar to and would like to be like (Gibson, 2004). Previous research suggests that role models are effective identity safety cues and benefit marginalized groups that may anticipate experiencing social identity threat (Cheryan et al., 2011; Johnson et al., 2019; Pietri et al., 2020). For example, Johnson and colleagues found that Black women students who learned about a Black man or a Black woman professor in a hypothetical STEM setting reported greater anticipated belonging and trust, relative to those learning about a white man or a white woman professor (Johnson et al., 2019). Black women students reported feeling more similar to the Black man and Black woman professor than the white man or white woman professors, resulting in the white professors doing very little to promote identity safety (Johnson et al., 2019). The same investigation also found that having Black men and Black women as role models in STEM positively related to feelings of belonging for Black women STEM majors (Johnson et al., 2019). Likewise, access to role models with a shared racial identity has also been found to promote identity safety among Black students (Dasgupta, 2011). Taken together, this past work suggests that in the present investigation, learning about a Black professor in STEM will serve as a particularly potent identity safety cue among Black participants.

***Signaling allyship via antiracism***

Exposure to an *allyship cue* can also mitigate social identity threat concerns and promote belonging. An allyship cue is similar to an identity safety cue; however, it is an explicit signal that indicates a person acts in support of a marginalized group (Johnson et al., 2020). A growing number of studies have documented the importance of allyship as a means to promote positive perceptions of STEM settings and feelings of identity safety in STEM (Johnson et al., 2019; Johnson & Pietri, 2022; Moser & Branscombe, 2023). For instance, Moser & Branscombe (2023) examined whether commitment to allyship from a male co-worker would signal identity safety for women in male-dominated environments. The researchers found that an equality-supportive male ally increased anticipated support and respect among women recruited from the general population and women in STEM (Moser & Branscombe, 2023). Gathered from this work, pairing an outgroup member with an allyship cue can potentially promote feelings of belonging among marginalized individuals.

Importantly, for Black individuals, past work has found allyship cues function to promote anticipated belonging in STEM environments. Johnson and Pietri (2020) examined whether different allyship cues (e.g., self-identifying as an ally, a Black woman describing a positive experience with a white woman employee and labeling her an ally) would encourage perceptions that the white woman employee was an ally among Black women. The authors found that pairing the white woman employee with any allyship cue was more beneficial than the absence of an allyship cue for promoting allyship and belonging among Black women, suggesting an allyship cues are beneficial for helping outgroup members promote identity safety. Applying this past work to the present experiment suggests allyship cues maybe beneficial for Black individuals.

One unexplored allyship cue is the use of antiracism content in STEM classrooms. Indeed, an increasing number of STEM instructors and practitioners have argued that incorporating antiracism into STEM environments benefits racially marginalized groups (McGee, 2020; McGee, 2022). However, to date, research has yet to experimentally examine antiracism as an allyship cue. Embedding antiracism content into a professor's syllabus maybe one useful way to test the efficacy of antiracism as an allyship cue. Previous research has already begun to explore how embedding identity safety cues in syllabi can influence student participants' expected outcomes and initial impressions of an instructor (Howansky et al., 2021; Maimon et al., 2021). Howansky and colleagues (2021) found that marginalized students that viewed a syllabus that incorporated identity safety cues (e.g., a welcome banner, the instructors' pronouns and name pronunciation, a diversity, equity, and inclusion statement) reported greater belonging than students that viewed a syllabus with such cues absent. Similarly, incorporating antiracism in a STEM syllabus may function as an effective allyship cue because antiracism explicitly acknowledges the existence of systemic racism and identifies actions to combat racial inequity in STEM (Ashburn-Nardo, 2018; McGee, 2022). Thus, in the present experiment, we investigated the benefit of an antiracism statement as an allyship cue among Black participants.

### *The current research*

In the present experiment, we examined antiracism as an allyship cue in the context of a Black (versus white) computer science professor's syllabus among Black participants. Specifically, Black participants were asked to imagine they were enrolled in a fictitious introductory STEM course, and viewed syllabus with either a Black professor with antiracism syllabus content, a Black professor with general DEI syllabus content, a white professor with antiracism syllabus content, or a white professor with general DEI syllabus content. After

viewing their randomly assigned syllabus, participants reported perceptions the professor was an ally and how similar they felt to the professor. Likewise, to serve as our proxy for identity safety, participants also reported their anticipated trust and belonging in the professor's classroom, and their interest in engaging with the professor in the future. Of note, to serve as a conservative test of our research questions, in the present experiment we recruited Black adults (i.e., a non-student sample) from the general population to serve as participants.

Consistent with past work (Johnson et al., 2019), we predicted that the Black professor would promote greater allyship, similarity, and identity safety than the white professor. Extending past work, we also hypothesized that greater allyship and identity safety would be signaled when participants viewed a syllabus with antiracism course relative to a syllabus with a general DEI statement. Put differently, we predicted that participants would report the greatest perceptions of allyship and identity safety when viewing the Black professor with the antiracism syllabus. However, we also predicted that for the white professor, the antiracism syllabus would be beneficial due to antiracism as a salient allyship cue. Specifically, we predicted that the white professor would elicit greater allyship and identity safety when paired with the antiracism syllabus relative to the control DEI statement in the syllabus.

## Method

**Participants.** Five hundred and seven Black men and women participants were recruited via Prolific and were paid approximately $2.85 for a 12-minute study (approximately $14.43/hour) for their participation. Sample size was informed by previous research examining allyship and identity safety cues among Black students (Johnson et al., 2019).

We excluded 13 participants for indicating they were not a Black man or woman. Of the remaining 494 participants, we also utilized a manipulation check administered at the end of the

study, following the completion of all dependent measures, to eliminate participants that failed the manipulation checks. The manipulation checks asked participants to identify the race of the professor in the featured syllabus, and the type of content featured in the course syllabus. We removed 62 participants that selected the incorrect race or syllabus content, leaving a final sample of 432 participants.

**Demographics**. Participants reported their age in years ($M$ = 33.96, $SD$ = 10.10). When reporting highest level of education, participants either had a high school degree/GED ($n$ = 137, 31.7%), a 2-year college degree ($n$ = 67, 15.5%), a 4-year college degree ($n$ = 171, 39.6%), a master's degree ($n$ = 50, 11.6%), a doctorate degree ($n$ = 2, .5%), a professional degree ($n$ = 1, .2%), or no degree at all ($n$ = 3, 0.7%). Ninety-four (21.9%) participants in our sample reported they were a student, and 93 (21.5%) participants in our sample reported that they currently work in a STEM field.

**Procedure.** Participants were first presented with informed consent, which provided information about the study. The informed consent form explicitly stated that participation was voluntary, the reason the study was being conducted, what to expect during the study, and potential risks and benefits of participating in the study. Participants were also made aware that their information would be protected, and that they could expect financial compensation for completing the study. After providing informed consent, participants began the experimental session.

The experiment had a 2 (Professor race: Black versus white) × 2 (Syllabus content: general DEI statement versus antiracism statement) between-subjects design, with four conditions: Black professor-general DEI statement [$n$ = 120], white professor-general DEI statement [$n$ = 103], Black professor-antiracism statement [$n$ = 110], and white

professor-antiracism statement [$n$ = 99]. Our procedure and materials were consistent with previous research examining allyship and anticipated belonging among Black participants (Johnson et al., 2019; Maimon et al., 2021). All participants viewed a fictitious school of science and technology and were asked to imagine they were a student at the school. All participants then viewed a syllabus for a computer science course. All of the syllabi included an image banner at the top of the page with a "computer science" graphic. The syllabi also included the name of the course, the professor's photo and name, class meeting time, office hours, and pronouns. Under the professor information, course objectives, course format, and optional review sessions were listed. Reference the appendix for a complete view of each syllabus.

To manipulate the race of the professor in the syllabus we utilized photos from previous research by Johnson et al., 2019. These photos were pilot tested and were found to be matched on attractiveness, perceived competence and age. Both photos showed a professional headshot of each professor, both in a black suit with a blue necktie, and both named Ricky Courtney. The professor was also smiling and participants in the Black professor condition saw the photo of the Black man, while those in the white professor conditions saw the photo of the white man (reference the appendix to see the images utilized).

In addition to manipulating the professor's race, we also manipulated whether the syllabus included an antiracism statement or a more general DEI statement. Both statements were developed by the investigative team and were modeled after statements typically used in course syllabi. The antiracism statement emphasized commitment to practicing antiracism in the classroom. Specifically, it stated, "*Through course assignments, activities, and content, we will actively empower one another and together engage in consistent action to combat systemic racism within our classroom and the broader computer science community.*" In contrast, the

general DEI statement emphasized commitment to practicing diversity, equity, and inclusion (DEI), saying "*Through course assignments, activities, and content, we will actively empower one another and together engage in consistent action to combat systemic inequity within our classroom and the broader computer science community.*" Reference the appendix for the full statements.

After viewing the STEM course syllabus and information about the professor, participants reported measures of perceived allyship of the featured professor, perceived similarity with the professor, anticipated belonging and trust in the classroom, and interest in taking a course with the professor. Participants reported demographics, were debriefed on the goal of the study, and thanked.

## Measures

In the experiment, we measured all continuous variables using a 7-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree). For each measure, we averaged participants' responses to the items, with higher scores indicating more of each measured construct. Measures used are described below. Exact items for all measures in the experiment can be found in the appendix.

***Perceived allyship.*** After reading their assigned syllabus, participants rated the level of allyship they perceived their randomly assigned professor to have over four items (e.g., "I view this professor as an ally to the Black community"; Johnson et al., 2019, $M = 5.57$, $SD = 1.15$, $\alpha = .93$).

***Perceived similarity.*** Participants also rated their agreement with how much they perceived the professor to be similar to themselves over four items (e.g., "This person's values and my values are similar"; Pietri et al. 2018, $M = 4.87$, $SD = 1.43$, $\alpha = .93$).

***Anticipated belonging and trust***. Next, participants rated their anticipated belonging and trust in the course from the assigned professor over 14 items (e.g., "I would feel accepted in this STEM course"; Purdie-Vaughns et al., 2008; Walton & Cohen, 2008, $M = 5.27$, $SD = 1.07$, $\alpha = .94$).

***Interest***. Participants rated their agreement on how comfortable and interested they would be in interacting with the professor outside of class over six items (e.g., "I would enjoy having this professor as my mentor or advisor"; $M = 5.41$, $SD = ,1.24$ $\alpha = .94$).

## Results

For all dependent measures, we ran between-subjects ANOVAs with professor race (Black or white) by syllabus content (antiracism or control DEI statement). Full ANOVA results, means, and standard deviations for outcomes across all conditions are provided in Table 1. Correlations across all dependent measures are presented in Table 2.

***Perceived allyship***. For perceived allyship, both a significant effect of professor race and syllabus content emerged. Participants reported greater allyship when viewing the Black professor in the syllabus relative to when viewing the white professor, $p < .001$, *mean difference* = 0.77, $SE = .07$, $d = 0.75$. When viewing the antiracism statement, participants also reported greater allyship than when viewing the DEI statement, $p < .001$, *mean difference* = 0.56, $SE = .07$, $d = 0.49$.

***Perceived similarity***. There was greater perceived similarity when participants viewed the Black professor than when they viewed the white professor, $p < .001$, *mean difference* = .92, $SE = 0.09$, $d = 0.69$. Participants also reported greater perceived similarity with the professor when they viewed the antiracism statement in the syllabus than when they viewed the general DEI statement, $p = .003$, *mean difference* = 0.40, $SE = .09$, $d = 0.29$.

***Anticipated belonging and trust***. Similar to both perceived allyship and perceived similarity, participants reported greater anticipated belonging and trust when viewing the Black professor compared to when viewing the white professor, $p < .001$, *mean difference* = 0.44, *SE* = .07, $d = 0.27$. Participants reported greater anticipated belonging and trust when viewing the antiracism statement compared to when they viewed the general DEI statement, $p = .045$, *mean difference* = 0.20, *SE* = 0.71, $d = 0.20$.

***Interest***. Lastly, when the participants viewed the Black professor, they reported greater interest compared to when viewing the white professor, $p < .001$, *mean difference* = 0.57, *SE* = .08, $d = 0.49$. Participants reported marginally greater interest when viewing the antiracism statement than when viewing the general DEI statement, $p = .061$, *mean difference* = 0.22, *SE* = .08, $d = 0.19$.

**Table 1**

*ANOVA and Means and Standard Deviations Across All Conditions*

| | Professor Race | | | Syllabus Content | | | Professor Race × Syllabus content | | |
|---|---|---|---|---|---|---|---|---|---|
| Measures | *F* (1,428) | *p* | $\eta_p^2$ | *F* | *p* | $\eta_p^2$ | *F* | *p* | $\eta_p^2$ |
| Perceived allyship | 58.48 | <.001 | .120 | 31.24 | <.001 | .068 | .34 | .560 | .001 |
| Perceived similarity | 49.84 | <.001 | .104 | 9.21 | .003 | .021 | 0.04 | .842 | .000 |
| Anticipated belonging & trust | 18.85 | <.001 | .042 | 4.04 | .045 | .009 | .014 | .905 | .000 |
| Interest | 24.54 | <.001 | .054 | 3.53 | .061 | .008 | .001 | .980 | .000 |

Mean (Standard Deviations) across Conditions

| | Control DEI Statement | | Antiracism Statement | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Black professor | White professor | Black professor | White professor | Black professor | White professor | Antiracism statement | Control DEI Statement |
| Measures | M (SD) | M (SD) | M (SD) | M (SD) | M (SD) | M (SD) | M (SD) | M (SD) |
| Perceived allyship | 5.69 (1.07) | 4.98 (1.09) | 6.31 (.87) | 5.48 (1.14) | $5.99_a$ (1.03) | $5.23_b$ (1.14) | $5.92_b$ (1.08) | $5.36_b$ (1.14) |
| Perceived similarity | 5.12 (1.27) | 4.22 (1.32) | 5.54 (1.37) | 4.59 (1.45) | $5.32_a$ (1.34) | $4.40_b$ (1.40) | $5.09_b$ (1.49) | $4.71_a$ (1.37) |
| Anticipated belonging & trust | 5.43 (0.99) 5.62 | 4.99 (1.01) 5.05 | 5.64 (1.06) 5.84 | 5.19 (1.14) 5.26 | $5.53_a$ (1.03) 5.72 | $5.09_b$ (1.08) 5.15 | $5.43_b$ (1.12) 5.57 | $5.23_a$ (1.03) 5.36 |
| Interest | (1.13) | (1.16) | (1.21) | (1.30) | (1.17) | (1.23) | (1.28) | (1.18) |

*Note*. Within each row, means with shared subscripts are not significantly different.

**Table 2**

*Correlations among Variables*

| Variable | 1 | 2 | 3 |
|---|---|---|---|
| 1. Perceived Allyship | - | | |
| 2. Perceived Similarity | .67* | - | |
| 3. Anticipated Belonging and Trust | .72* | .78* | - |
| 4. Interest | .69* | .76* | .86* |

***Note.*** * = $p < .001$, ** = $p < .01$

## Discussion

The present work aimed to examine how to signal allyship to Black adults in a fictious STEM environment. That is, we investigated who signals allyship and promotes identity safety in Black adults by manipulating the presence of antiracism content and a professor with a shared racial identity in the hypothetical STEM classroom setting. As we predicted, in the present experiment, we found that the Black professor promoted greater belonging and trust than the white professor. Previous research finds that a role model with a shared racial identity positively relates to greater feelings of belonging in an institution for Black students in STEM (Johnson et al., 2019); thus, the current work conceptually replicates previous work. Likewise, we also found that participants perceived greater similarity and allyship with the Black professor relative to the white professor, a finding also consistent with past work (Pietri et al., 2018). Extending this previous research, we also found that an antiracism message in the syllabus was a particularly potent identity safety cue. Specifically, we found that the antiracism content promoted more allyship in Black adults than a general diversity, equity, and inclusion (DEI) statement. In addition, the antiracism content also promoted more anticipated trust and belonging, similarity, and interest in Black adults compared to the general DEI statement in this study.

The present experiment also highlighted how a white professor can encourage allyship and positive STEM outcomes for Black students. We found that when the white professor was paired with the antiracism statement, Black students reported greater allyship, trust and belonging, similarity, and interest than when the white professor was paired with the general DEI statement. Previous research suggests that incorporating identity safety cues into a fictitious course syllabus can influence participants' outcomes and initial impressions of the course instructor (Maimon et al., 2021). Extending this past work, we found that pairing antiracism

content with a white professor increased reports of allyship, trust and belonging, similarity, and interest in Black adults. Taken together, the present experiment finds that an allyship cue of antiracism content influences Black participants' perceptions of a white professor more so than general DEI content in a fictitious introductory STEM course syllabus.

The present work has important theoretical and practical implications for research geared toward increasing the representation of Black students in STEM environments. In line with past theorizing (Dasgupta, 2011; Murpy et al., 2007; Purdie-Vaughns et al., 2008), we found that an individual with a shared racial identity can signal identity safety for Black individuals, as evidenced by the Black professor condition outperforming the white professor condition. Signaling identity safety for Black individuals in STEM environments is critical to counter ongoing and historical underrepresentation. Researchers have found that a lack of representation in STEM environments can deter marginalized students from pursuing STEM careers and impact their anticipated success (Cheryan et al., 2011). However, in the present work, we found that participants tended to report greater interest in STEM when viewing the Black professor, suggesting that STEM becomes more approachable when Black participants received a signal that their identity would be valued in STEM environments. Signaling that their Black identity is valued in STEM environments through identity safety cues can help attract Black students to STEM environments.

The current study adds to research on allyship and role models by further demonstrating that greater allyship is reported when Black participants are presented with a professor who holds a shared racial identity than a professor with a different racial identity. Past work has previously demonstrated that shared racial identity is particularly critical for signaling allyship (Johnson & Pietri, 2022), and the current work extends these findings to a hypothetical STEM classroom.

Extending past work on allyship, we also found that an antiracism statement signaled greater allyship than a general diversity, equity, and inclusion (DEI) statement included in the fictitious STEM introductory course syllabus, showing that antiracism is a more beneficial allyship cue, as it goes above and beyond a general endorsement of DEI. Thus, one implication of the present work is that STEM educators and policymakers should identify pedagogy that centers antiracism to support Black students (relative to general DEI efforts broadly). For example, framing racism as a public health emergency in a biochemistry classroom may serve as one pedagogical technique to center antiracism (Holland et al., 2022) that also can foster inclusion for Black students. Our study enriches our understanding of theories pertaining to the effects of allyship in STEM environments by introducing the importance of antiracism as a tool to foster inclusion.

One notable limitation of the present work is that the design of the hypothetical classroom did not allow us to adequately examine the effects of antiracism in a real-life scenario. Participants reported greater allyship in conditions including the Black professor and antiracism statement; however, we do not know if these results would transfer to a real introductory STEM college course. Similarly, this study examined how Black adults responded to signals of allyship in the STEM environment. However, it is possible that our results would not generalize to Black college students. Future research should examine antiracism signals in college classrooms with Black students to address these limitations. Another limitation is that this study does not look at whether a Black professor or white professor can signal allyship to other marginalized racial identities. Incongruent marginalized racial identities (e.g., Latinx, Native American) may impact the degree to which members of other racially marginalized groups see a Black professor as signaling allyship. Identity-safety transfer research suggests that other racially marginalized students that share similar negative stereotypes with Black individuals in STEM environments

may also perceive a Black professor as signaling allyship (Chaney et al., 2016). Researchers should adopt a design that allows for a more accurate representation of a STEM course with Black students, as well as aim to look further into other racially minoritized groups.

Future work should examine further the limitations we have discovered within the current study. Several studies have highlighted that shared racial identities and diversity statements can be associated with positive outcomes for minority students in STEM environments in which they are underrepresented (Johnson et al., 2019; Cipollina et al., 2020). Further work is needed to better understand what promotes higher levels of allyship for Black students in STEM environments beyond shared identities and antiracism statements. Until Black students are equally represented in STEM classroom environments, it is important to incorporate methods to signal allyship and identity safety to promote diversity and encourage Black students in such areas, with the goal to transfer research to real-life situations.

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# Appendix


## CS101: INTRODUCTION TO COMPUTER SCIENCE

**Name:** Professor Ricky Courtney

**Class Meeting Time:** Asynchronous Lectures (Mon/Thurs)

**Office Hours:** Synchronous Open Office Hours via Zoom – Mondays & Thurs (see course site for zoom link)

**Pronouns:** he/him/his

### COMMITMENT TO ANTI-RACISM

In this classroom and in the department of computer science, we are committed to practicing anti-racism. Through course assignments, activities, and content, we will actively empower one another and together engage in consistent action to combat systemic racism within our classroom and the broader computer science community. We acknowledge that regardless of one's own race or ethnicity, we are all at a different point in our anti-racist journey, and will strive to hold each other accountable to promote and sustain systemic racial equity.

### COURSE OBJECTIVES

The goal of computer science is to learn how to apply computational modes of thought to frame problems and to guide the process of deducing information in a computational manner.

This course is aimed at students with little or no prior programming experience, but a desire to understand computational approaches to problem solving.

The course will provide students with an overview of writing small programs, mapping scientific problems into computational frameworks, and preparation for easier entry into Computer Science as a major or minor.


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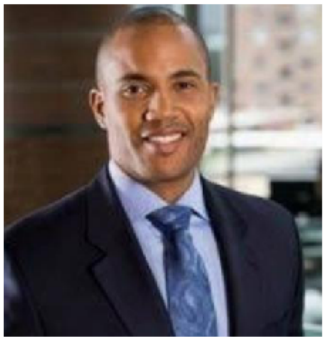

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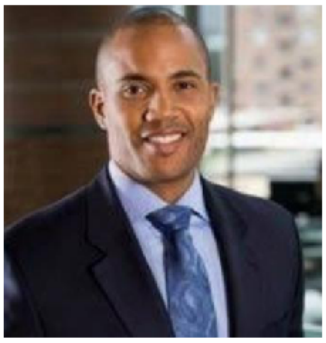

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All items will be assessed using the following response scale
1 = *strongly disagree*, 2 = *disagree*, 3 =*disagree somewhat*, 4 = *neutral*, 5 = *agree somewhat*, 6 = *agree*, 7 = *strongly agree*

**Measure of Allyship (Johnson et al. 2020)**
While reflecting on the STEM course professor, read each statement below and rank your agreement.

- Most likely this professor cares about issues related to Black people.
- I view this professor as an ally to the Black community.
- I view this professor as committed to doing their part to combat racism in computer science.
- Most likely this person cares about helping Black individuals succeed in the sciences.

**Measure of Perceived Similarity (Pietri et al. 2018)**
While reflecting on the STEM course professor, read each statement below and rank your agreement

- This person seems similar to me
- I can identify with this person
- This person's values and my values are similar
- Most likely, this person and I care about similar issues

**Anticipated Belonging and Trust (Purdie-Vaughns et al. 2008; Walton & Cohen, 2008)**
Imagine that you are enrolled in the STEM course with the syllabus and professor you viewed. Read each statement and rank your agreement from strongly disagree to strongly agree.

- I would like to be in a class like this course.
- My classmates in this course would become my close personal friends.
- I would be treated fairly by my classmates in this course.
- I would trust the professor to treat me fairly.
- My values and the values in this professor's course are very similar.
- I would feel accepted in this course.
- I would feel valued in this course.
- I would feel like I could be myself in this course.
- I would feel comfortable in this course.
- I would feel anxious in this course.
- I would feel respected in this course.
- I would feel appreciated in this course.
- I would feel like an outsider in this course.
- I would enjoy being an active participant in this course.

**Interest.**
Imagine that you are enrolling in another STEM course for the next semester. Rank your likelihood of taking another course offered from this professor.

- I would feel comfortable going to this professor's office hours.
- I would feel comfortable asking if I could work as a research assistant in this professor's lab.
- I would be excited to take a class with this professor.

- I would enjoy having this professor as my mentor or advisor.
- I would be excited to work as a research assistant in this professor's lab.
- I would like to learn about this professor's research and lab.

**Manipulation Check Questions**

You will now answer a few questions about the organization and employee profile you read about at the beginning of today's study to test your memory of the information presented.

**What was the race/ethnicity of the professor in the featured syllabus you read during today's study?**

- Black
- White
- Pacific Islander
- Asian

**What type of course did you imagine to be enrolled in during today's study?**

- Psychology
- History
- Computer Science
- Art

**What type of content was in the featured syllabus you read during today's study?**

- Antiracist statement
- general DEI statement
- Class schedule
- Attendance Policy