

Talking & Working for Diversity When You Don't Belong to a Minority Demographic

Adrienne R. Minerickⁱ, Ebonye-Rosa T. Allenⁱⁱ, Bill B. Elmoreⁱⁱⁱ

Abstract – It is vital to the future of our society that individuals from diverse backgrounds and experiences excel in the engineering profession. While those of us who do not represent a minority demographic might feel intimidated to take a proactive role in encouraging and mentoring towards a healthy, diverse climate in engineering, this paper strives to open a dialogue, potentially dispel paradigms, and provide starting resources to accomplish this very goal. Two faculty members openly discuss their experiences of working for diversity in their roles as NOBCChE (National Organization for the Professional Advancement of Black Chemists and Chemical Engineers) and AIChE (American Institute of Chemical Engineers) faculty advisors, respectively. Discussions are augmented by the perspective of a senior, African American, Chemical Engineering student. Discussions include how to a) develop a reputation for being approachable, b) develop credibility as a source for sound advice, c) talk with students about their perceptions, d) obtain feedback on climate in classes, etc., e) learn about background / circumstances that can adversely affect the journey to an engineering degree, and f) proactively improve perceptions and climate for future students.

Keywords: Diversity, Perceptions, Climate, Student organizations

INTRODUCTION & MOTIVATION

Diversity can be a scary topic to broach. Initiatives from NSF and elsewhere have brought the importance and resources to address this issue to the forefront, yet few people discuss this topic in diverse company or with unfamiliar individuals. After one author recently served on an NSF review panel, it became apparent that this topic is in danger of becoming “BigCorporationCaresAboutTheEnvironment” lip service of modern faculty members – solely as an obligation to adhere to Broader Impact requirements. The continuing disparity between the percentage of ethnic minorities in the U. S. population and their enrollment in and graduation from engineering programs illuminates the importance of faculty actively seeking to understand and address diversity issues [1]. In order to improve activities and diversity efforts, one needs to gather information on the issues specific to their institution and be willing to discuss the pros and cons of certain situations or classroom techniques. Improvement can be initiated by first admitting the possibility that we, as faculty members, may inadvertently contribute to an unfriendly climate and we must study ways to promote a healthy, welcoming environment for all students.

Developing a diverse engineering workforce is of utmost importance for the future of the engineering profession [2]. Companies striving to stay in business for generations push the envelope of technology; this is where innovation and new perspectives are crucial. For example, most people are motivated to develop products that will have an impact on herself, himself, or someone they love. For example, a team of women designing cars think about where the in-car light is located, and for childcare and safety reasons, situate it near the floor instead of its common location in the dome of the car [3]. This suggests that similar people with similar experiences will conceive a subset of product ideas relating to their subset of experiences. Even one individual with a different set of experiences adds a myriad of new ideas and new applications. However, one individual is sometimes overshadowed or excluded from the group. What can a whole team of individuals from diverse backgrounds accomplish? First steps first; for there to be a team, there needs to be a variety of engineers available. This is where educators come in; educators can strive to develop diverse individuals, not mold every student into a clone engineer.

Progress and Resources to Learn About Current Diversity Issues

A number of excellent articles have been published on promoting diversity and measuring progress towards this goal. One comprehensive study is Gary May's "Retrospective on Undergraduate Engineering Success for Underrepresented Minority Students" [4]. This article examines a variety of factors and correlates them with student success. It shows the impact of different types of minority recruitment and development programs; this is an excellent resource that provides concrete evidence for administrators who want to promote diversity at the college or university level. Additional articles identify opportunities for improvement [5] and address the impact of attitude and motivation within a major [6]. Inclusive activities are comprehensively reviewed by Rover [7], while the importance of perceptions on campus climates and thus graduation rates are extensively explored by Brown [8]. Some of the suggested strategies outlined in this paper, such as developing relationships, changing paradigms, and minority student groups, are more extensively discussed by Johnson, Fromm, and Van Aken, respectively [9, 10, 11].

Goals of This Paper

This paper (and subsequent presentation) strives to lay out a path to involve faculty from majority backgrounds in diversity issues, climate assessment, and environment improvement. Specifically, the authors will discuss

- I. Opening a dialogue on diversity
 - a. Developing a reputation for being approachable
 - b. Talking with students about perceptions
 - c. Obtaining feedback on climate in classes / departmental community
 - d. Learning about backgrounds / circumstances
- II. Dispelling paradigms
 - a. Talking with students about perceptions
 - b. Approaching the topic in a general audience
 - c. Facilitating networking at multiple levels
- III. Providing resources and venues for improvement.
 - a. Minority student organizations - The pros and cons
 - b. Promoting visibility
 - c. Proactively improving perceptions

Each topic is discussed and in most cases augmented with anecdotal experiences from the authors.

OPENING A DIALOGUE ON DIVERSITY

Diversity is not a subject that just concerns members of underrepresented minority groups. In addition, underrepresented minorities should not be the only ones talking and working for increasing diversity. In this section, the authors talk about some of the beginning steps that can be taken to open a dialogue about diversity issues with students from underrepresented groups. A majority of the examples given involve African-American students, the strategies outlined are applicable to students from all underrepresented groups.

Developing a Reputation for Being Approachable

Initial encounters between a new faculty member and the students reveal student curiosity and apprehension at the same time. The faculty member is an unknown quantity, different; students cannot predict how the faculty member will test; what is expected of them, etc. In the experience of the first author, students who came by my office were initially timid but quickly became comfortable in their interactions with me. However, the small group of African-American students in my class did not yet venture into my office – my invitations in class went unheeded by this group. It took a few one-on-one interactions in class to change this. I typically have one or two in-class problems where I walk around the room and talk with students individually about the solution procedure. In this venue, I was able to approach my more timid students and ask how the problem was going. Upon discovering that this brief interaction was not as terrifying as originally presumed, my more timid students started coming by my office. A subset of these included my African-American students.

The lesson learned from this experience is that it is important to make the first move. A professor can't just state that they are approachable; they needed to *show* that they are approachable. Furthermore, it occurred to me that it only takes one bad experience to “condition” a person to be wary. I found this eye opening, especially after considering interactions with former professors and colleagues across campus. Was it possible just one of them might be less than approachable? Was it possible one of them was even insulting, suggesting that a question was stupid? For the very secure, self-assured students, this unfriendly behavior may have been a minor setback. However, for an insecure student or for a student feeling socially isolated, this experience would raise doubts about the climate, or their own abilities, especially if they were already struggling with the subject.

Reality is that these experiences are likely. If it didn't happen directly to one of your students, it has probably happened to someone fairly close to them. It can take time to overcome this aversion; it is best to proactively seek out your timid students to inquire how they are doing. These students will eventually start seeking you out for advice and help. Your reputation will spread and soon other students will begin visiting as well.

The experiences of the third author are similar. During his sixteen years of student recruiting and advising, he has noted the critical step of approaching students of all backgrounds with a spirit of humility and an eagerness to see them grow and succeed. By observing and actively engaging the less assertive students, faculty members can learn background information, gain understanding, and then proactively and positively impact the student's learning experience and self-confidence. He has found that a small, personal effort can strengthen academic performance and ultimately influence professional success.

Talking with Students About Perceptions

Perceptions can have a significant impact on individual attitudes and thus on the climate in a community of students. Perceptions are particularly tricky because they are often originally based upon a concrete event, but develop due to how the event is interpreted. They can be damaging, especially if a generalization is made about the entire demographic.

As an example, consider a conversation that occurred in 1975. A full professor (white male >50) is talking with a female faculty candidate in a social networking reception at a national conference. The topic is faculty positions. The full professor leans in and expresses in that hushed, in-confidence voice, “We hired a woman about five years ago. She was terrible, she did..... We'll never do that again.” While this sounds like a mindset from a time long past, it really is not. In 1975, women were making inroads into science and engineering faculty positions. Thirty years later, a variety of underrepresented minorities are making their first inroads into faculty positions. African-Americans comprise a mere 2.1% of professors in engineering; the percentage of tenure / tenure-track Hispanic professors is only slightly better at 2.9% [12]. This suggests a very high likelihood that a minority professor is the first in their department, or even in their college. What comments do these individuals endure? It is usually, “The department really needed to hire a minority” of which the unsaid corollary can be, “you were hired primarily because of your ethnic / racial classification and not your credentials.” At the undergraduate level, students don't even bother using hushed tones to say things such as, “You'll have no trouble finding a job; you're a minority.”

The perception on the part of the non-minority students is that the mere fact someone is a member of an underrepresented group gives them a leg-up in terms of employment opportunities, scholarships, etc. The perception on the part of minority students can be that they are valued only for the quota numbers and not for their skills. In some cases, these same students have actually had a rougher path through school, due in part to a lack of key mentors within their extended family who have experience in college, science, or engineering fields. In addition, minority students become acutely aware of the scrutiny they are under. Just as the full professor did in 1975, if an African American student fails a class, far too many make a generalization on the abilities of all African American students. “They just aren't as well prepared.” The point here is that no student should ever be treated differently on the basis of such an assumption. Each student boasts a different background, and treating each as an individual goes a long way in reversing negative perceptions.

Once a dialogue is open, certain students will seek out a professor in order to work through frustrations associated with unfair generalizations. For example, one graduating senior confessed during a discussion that she would not advise any other minority student to pursue a degree at her university. She began listing a series of experiences: minority representation in the Student Senate, comments made, isolation in project teams, etc. Each event

separately could be perceived by a majority individual to have a plausible secondary explanation, or be brushed aside as an unfortunate coincidence. However, when viewed collectively, they created a suffocating environment. **The lesson here is that while an obstacle may not be insurmountable, repeated obstacles can become wearying and collectively drag a person down. Talking openly about perceptions can help all individuals put events in perspective and realize the impact of their behaviors.**

Obtaining Feedback on Climate in Classes / Departmental Community

Climates arise when multiple individuals perceive similar negative or positive undertones to interactions. Multiple situations give rise to a trend or an overall attitude that is biased. Attitudes that reinforce a climate can be learned and can evolve from class year to class year.

One such example is that of isolation of minority students. At the senior class level, seven students (3 African-American, 4 Caucasian) walk into their Unit Operations Lab. The professor goes through the syllabus and explains that teams of 3 or 4 will work on experiments together through the semester and then allows the students to choose their own teams. One of the Caucasian girls speaks up and says, "The four of us will be in a group." Subsequent discussion with the three African-American students brought out that they were left feeling like a) kids who weren't picked in gym class, b) second best, and c) isolated professionally as well as socially. **The lesson learned is that sometimes what is most comfortable for the students is not what is best for their education. Choosing and balancing student teams is one of the most important things a professor can do in support of diversity.**

Students don't necessarily come into a community (a department) with similar attitudes [13]. They learn to fit in and adapt to the existing climate. In their first semester, three freshman African-American students are enrolled in a lecture class of 46 students. On the first day, these three minority students are spread out across the room. One is in the front row, displaying abundant enthusiasm and actively answering the professor's questions. By the second day, the two female African American students are sitting together on the far side of the classroom, away from the bulk of the class. By the fifth class day, the front row student has moved to sit behind the two female students and is no longer sitting on the edge of his seat, interacting closely with the professor. During these same five class periods, the majority students have largely begun forming social circles, talking extensively before class and joking around. Strategies to address this phenomenon are discussed in the "Facilitating networking at multiple levels" section.

Learning About Backgrounds / Circumstances

Administrators are one step removed from the population they manage. They compile numbers and add money to (new) programs to encourage involvement of underrepresented groups. This is crucial, but the real difference is made via positive interactions with individual students [14]. Mentoring of individual students is most effective if personalized advice is given [15].

A freshman from an underrepresented group approached the first author asking for a signature on his change of major form. The Professor asks why he is interested in changing majors and inquires about his new major. The answer, music, comes as a surprise. The student expresses that he isn't doing as well as he wanted in classes and that he just really enjoys playing the drums – they help him relieve stress. When asked if he wanted to talk further about it, he was hesitant, but willing. We began by talking about what he had expected coming into college. He expressed how many friends he had in high school and how central he had felt to projects and the community. The only time he feels that camaraderie in college is when he is playing the drums in marching band. We then talk about his career goals and he expressed how much he wanted to be a chemical engineer, and was considering graduate school. He mentioned that he is a first generation college student and his family doesn't relate to his struggles. We struck a deal. He gave chemical engineering another semester, we outlined a list of resources (social and academic), and we now meet weekly to talk. We also sat down to plan his classes for the next semester; he listed his current classes and the grades he expected, which tallied to a GPA of 3.85. **The lesson here is that if I had allowed that generalization, "African-American students just aren't as well prepared," to couple with his assertion that he wasn't doing as well as he wanted in his classes, I probably would have come to the conclusion that he was close to failing a class.** Engineering tends to weed out weaker students, but being swayed by a generalization might prevent someone from putting forth the effort to learn about a student's actual background and their individual circumstances. A poor reaction on my part may have facilitated the next Meredith Guordine to choose music over

engineering. This particular student now visits regularly, is excelling in his classes and in band, and is on his way to becoming an AIChE student president.

As Program Chair for chemical engineering at Louisiana Tech and now serving as Undergraduate Coordinator at Mississippi State, the third author similarly has encountered numerous situations with students (minority or otherwise) who, on the surface, appear to be only struggling academically when further investigation revealed underlying issues contributing to the student's situation. In almost every case, the students respond favorably to personal attention and encouragement—raising their level of commitment to perform as they are capable.

DISPELLING PARADIGMS

The information gathering should never end. Each new student has a unique set of circumstances and experiences that impact their performance and subsequent success in engineering. There are not any cookie cutter fixes to correcting perceptions or climate issues. In the following section, the authors discuss some strategies that have been effective for them at their university.

Talking with Students About Perceptions

As a beginning dialogue, it can be useful to start a discussion in a more social setting within your minority student organization. If your department or college does not have their own minority student group, consider networking with the Black Student Association, Hispanic Student Organization (or equivalent) on your campus. In this setting, students are more comfortable and can express feelings they have without worrying about persecution later.

Be prepared for the conversation to start out slowly. Students can be cautiously testing the water. One author has found that talking about behaviors that she has noticed, then asking for a student's perceptions on what they thought brought it about, is an excellent catalyst to start a conversation. From this point onward, asking questions like an eager learner has been effective. The authors suggest taking notes to be able to accurately remember the content, tone and intent of what students say. Ask for permission to discuss the stories with others and if granted, do not ever link names with the story. If someone would like further information, separately approach the student and ask if they would like to share the story with the department or other interested individual.

Follow up with a second meeting where overarching themes and trends from the first meeting are discussed. Ask if the minority students would like to discuss any of these trends in mixed company. If they are willing, work through a "game plan", such as strategies to most effectively communicate the issues and get a productive response. Counseling services on your campus are excellent resources to help in any stage of this process. However, underrepresented students need an advocate in their own department, so it is not recommended that you completely step aside and become uninvolved.

As a faculty advisor, the topic of perceptions can come up in the middle of any type of event. During the NOBCChE Thanksgiving Social, one professor was trying to make small talk with the members and their guests. Her topics centered around school, and the conversation was sporadic until one gregarious young man showed up. His joking tone and lightheartedness turned the entire event into a celebration. The dinner was fantastic peppered with periodic teasing of every attendee. At the gregarious young man's cajoling, a fiercely competitive game of dominoes started. The pace of the game was so quick, the professor was struggling to keep up with the point system and strategy. Everyone was quite patient and one person later mentioned, "Most people don't think black people can do math like that." We talked briefly about how African Americans are not always heralded for their intellect and teased that he was going to change that perception. **The lesson here is that, after developing a rapport, students are freer to discuss perceived stereotype threats, and while they can't single-handedly change such a perception, know they shoulder an extra responsibility to refute such stereotypes.**

Approaching the Topic in a General Audience

Most people would advise not to approach this topic in a general audience, there simply is too great of a chance of offending someone by inadvertently saying something wrong. In reality, there is too great of a chance of losing great students by doing nothing about an unhealthy climate. To promote a healthy climate, to create a departmental community sensitive and welcoming to diverse people and diverse ideas, this topic needs to be discussed openly.

It can be valuable to start by increasing the visibility of diversity issues within a community. If a minority student organization does not exist in your department, the process of starting one can bring these issues forward. Faculty announcing and inviting everyone to these events sends the message that the events are important, valuable to attend, and of interest / importance to everyone.

After having set the foundation and motivation for including everyone in diversity discussions, set up a meeting where this topic is to be discussed. The importance of this is that everyone is able to gather their thoughts prior to discussing them openly. The key to starting a successful discussion is to express good intentions in order to create a friendly environment, listen carefully, and remain objective. One of the most frustrating situations for a student is to not be heard, to have someone rapidly brush a concern aside without truly thinking about it. Asking questions is a good way to reinforce interest and help a student further articulate the situation. Discussing other plausible explanations / view points is good along with the caveat that more time should be spent listening before and after expressing the plausible explanation. Discussions should be moderated to smooth over antagonistic wording or comments and lead to unthreatening discussions for a common goal.

Facilitating Networking at Multiple Levels

Once a dialogue is open, further encourage interactions and teamwork among the students. Within student organizations, encourage the students to actively pursue diversity on their committees, during brainstorming sessions, in their choice of events and outreach activities, etc. Whenever applicable, activities should be co-sponsored with minority student organizations. Within the classroom, assign short team exercises with groups that are chosen to promote diversity. Switch groups as frequently as is possible. The goal is to ensure that every student knows every other student and no subgroup is isolated. As a result of this activity, students will broaden their evening study groups and the student community will be more cohesive. It is also beneficial to discuss all of these issues openly in a faculty meeting and encourage colleagues to also utilize these strategies.

PROVIDING RESOURCES AND VENUE FOR IMPROVEMENT

Opening a dialogue about diversity is only the first step in identifying important issues to pursue and improve upon. Seek help and advice from your diversity office or the counseling center if any issue feels too big to handle alone. Many issues such as climate and perceptions are best handled with a sustained effort to change paradigms. While the nature of needed resources are different for every department and every student community, some general strategies that are applicable to all departments and are good starting points for improvement are outlined in this section.

Promoting Visibility

Students tend to seek out those similar to themselves because they are most comfortable and most familiar. However, the danger of this is that minority students tend to become isolated both socially and professionally from the rest of the student population. The strategies outlined in this paper that involve everyone in promoting diversity will help promote visibility of your minority students. In addition, encourage these students to run for leadership positions and to apply for awards and scholarships. Offer to write letters of recommendation and give feedback on resumes, personal statements, etc.

Seminars to help students learn to market themselves are extremely valuable. Consider inviting in a career counselor from the career center to talk to your minority student organization separately from their interactions with the student body. As mentioned before, backgrounds and circumstances can be different for minority students. Within a large room, some students will not want to speak up with questions, thinking that others must already know. Using anonymous index cards on which the students can write their questions can assist with this. If company representatives visit your department to give a seminar, facilitate co-sponsoring the event with the minority student organization. Be proactive about ensuring underrepresented minority students get as much face time with the recruiters as all other students.

Increase visibility by developing a nice webpage for your minority student organization and by providing links to resources online. Make this page forefront on the departmental webpage and not hidden more than two clicks away from the main page. This clearly communicates the commitment and priority your department places on promoting

diversity. If your department publishes any brochures or recruiting advertisements, make sure your minority student organization is highlighted alongside the professional societies. If your campus has a diversity office, ask that they display posters on your minority student organization. It can also be beneficial to invite representatives from your diversity office to visit student organization meetings so they can learn what the group is about and more about the profession. These individuals advise incoming freshman and are more likely to encourage students to pursue degrees in engineering if they feel the climate is friendly.

The visibility of your minority student organization should be especially promoted within your geographical region. Backgrounds of underrepresented students vary, but the authors have observed many students want to remain regionally close to family and friends. Help your minority student organization officers draft a letter soliciting sponsorship for a variety of activities, honors, or scholarships, and send this to regional companies. Invite representatives onto campus to give seminars. Ask the president of your minority student organization to open the session with a welcome, announcement, and invites to further events.

Minority Student Organizations – The Pros and Cons

Throughout this paper the authors have touted the importance of having a minority student organization within your department. The advantages of this include creating a safe environment with easy access to critical resources, establishing an identity within the department, and a community to provide strength to individual students [11]. However, any faculty advisor should be aware of the disadvantages and be sensitive to the impacts of this extra obligation on this subset of students.

Minority student organizations include a wide variety of groups such as sororities, fraternities, outreach service groups, mentoring programs, and professional societies. All of these organizations will put considerable effort into recruiting the same subset of students from underrepresented groups. Combined, these groups require a significant amount of time in a world where student time is scarce due to study obligations. Creating an additional minority student organization vying for student involvement can create a disadvantage due to extra time and effort obligations.

Sororities and fraternities pose another challenge. These groups are not usually science and engineering centric and as a result are not always accommodating of the greater study requirements in these demanding fields. If you notice a significant drop in student performance in just one semester, be proactive in asking what has changed in the student's life. If you observe a trend where numerous students drop off in performance and even transfer out of engineering due to Greek obligations, contact your student activities office or diversity office and ask for advice on how to increase sorority and fraternity sensitivity to this issue. This trend may happen college wide and may be worth approaching your dean's office to address it.

Outreach service groups and mentoring programs should be scheduled to not conflict with the student's busiest times of the semester. If this is identified as an issue during a discussion, encourage the students to assert their issues during the planning process of that group. If necessary, speak up as an advocate on behalf of the students. However, this lesson of speaking up for themselves is potentially good for students to learn. Mentoring programs can vary due to "just in time" mentoring strategies. It can be most time efficient to hold seminars establishing a foundation early in the semester and then provide follow up resources throughout the rest of the semester. A number of organizations have found that a summer bridge program is the most effective way to provide a foundation.

Within all groups and professional society meetings, make sure that the event is a good use of student time. Work with your officers to develop meeting management skills: starting on time, moving through business in a timely fashion, and then moving on to beneficial activities. Focus most of the "work" at the beginning of the semester and put more effort into social / stress relieving events toward the end of the semester. The NOBCChe club at MSU found that holding a study hall immediately after their meetings was beneficial. Students could hold group meetings at this time; extra travel to and from the building was minimized and the activity further promoted networking efforts and study habits.

Proactively Improving Perceptions

Continuously promoting dialogues on diversity will itself improve perceptions. These discussions will illustrate fallacies in generalizations and teach everyone to treat each other as individuals and not based on their ethnic / racial group. Faculty also have another extremely important responsibility. Whenever an inappropriate comment is overheard, it is crucial that the faculty member addresses the comment immediately and provides an unambiguous discussion on the negative impact and potential repercussions of such comments. Some argue that one should avoid embarrassing the student in public. The authors disagree. Comments made publicly can reinforce negative perceptions and contribute to unfriendly climates if they are not challenged publicly. Secondly, that individual has already embarrassed or adversely impacted other members of the class. Students who make such comments are likely to make them in a variety of other settings, and particularly memorable corrections of such behavior will make them think twice before saying similar things elsewhere. Furthermore, if the adversely affected group finds that you are an advocate, they'll feel less like a second place member of the community.

CONCLUSIONS

Developing a diverse engineering workforce is crucial for the future of our professions. This important topic concerns everyone and it needs further endorsement by majority individuals. This paper outlined possible strategies for opening a dialogue on diversity beginning with strategies to proactively show that you are approachable and to do more listening than talking. Protect any student who is willing to talk openly and provide feedback on ideas. The philosophy advocated was to treat every student as an individual in order to move thinking away from generalizations. Take the time to learn about students' backgrounds and thus avoid jumping to conclusions. Lastly, be sensitive to the impact of periodic adversity that students experience. The cumulative effect can be significant.

The authors recommended to always collect further information, but to begin dispelling paradigms with the support of your minority student population. The topic of diversity and tolerance of all ideas needs to be openly discussed in order to promote a healthy climate welcoming to all students. Professors should proactively form diverse teams and groups at all levels within a department.

General strategies for providing resources and venues for improvement are discussed. These include looking for methods to increase the visibility of your minority students, your minority student organization, and your department's dedication to a diverse, healthy climate. The authors strongly advocate forming and working with a minority student organization while concurrently being sensitive to the extra time obligation this places on the students. Lastly, make sure that no adverse comment goes unchallenged. Other strategies tailored for each department should also be pursued. If one method does not work as expected, do not be afraid to try others. The change to a healthy climate requires sustained effort from all, but an oppressive climate can develop quickly if an outspoken negative individual goes unchecked.

In conclusion, this paper advocates providing resources and opportunities for each student to achieve success. It does not advocate making exceptions for anyone because this contributes to the perception of inequity. Facilitate networking and social opportunities for underrepresented minorities in any way your department deems appropriate. The discussions provided within this paper are not exhaustive, but should provide a foundation from which to build and catalyze further discussions. Each department should invest the energy to learn the background of their students, provide opportunities for dialogues, and provide resources dedicated to the common goal of welcoming and embracing everyone.

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Adrienne R. Minerick

Adrienne Minerick is an Assistant Professor of Chemical Engineering at Mississippi State University. She received her PhD from the University of Notre Dame in August 2003. Adrienne teaches the required graduate ChE math, Process Controls, and helps with the Introduction to Chemical Engineering class. She is the faculty advisor of the newly established MSU chapter of the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers (NOBCChE). Adrienne's research is in medical microdevice diagnostics and dielectrophoresis. She is active in ASEE.

Ebonye-Rosa T. Allen

Ebonye-Rosa Allen is an undergraduate student in Chemical Engineering at Mississippi State University. She will receive her BS in December 2005. Ebonye-Rosa is active in the National Society of Black Engineers (NSBE) and in the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers (NOBCChE). She has actively mentored younger students; her efforts have significantly improved dialogues on diversity and positively impacted climate in her department.

Bill B. Elmore

Bill Elmore is an Associate Professor and Hunter Henry Chair in Chemical Engineering at Mississippi State University. He is the faculty advisor for the MSU chapter of the American Institute of Chemical Engineers and is an active mentor and advocate for undergraduate students in the department. Bill teaches the sophomore level chemical engineering analysis class and senior level unit operations lab. Bill's research is in microreactors. He is active in ASEE.

ⁱ Dave C. Swalm School of Chemical Engineering, Mississippi State University, Box 9595, Mississippi State University, minerick@che.msstate.edu

ii eta1@msstate.edu

iii elmore@che.msstate.edu