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Faculty Accessibility Cues: Opening the Doors to Classroom Communications

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Introduction

Given their role in advancing student learning in higher education, professors are uniquely positioned to help students navigate their educational journey and to provide the support and encouragement needed to survive and thrive in college (Fairchild, 2005). Frequent informal and close interactions with faculty, both inside and outside the classroom context, are associated with a variety of student outcomes including increased student effort in academic work (Cotten & Wilson, 2006; Thompson, 2001), higher motivation levels (Pascarella & Terinzini, 2005), and greater academic performance (Cotten & Wilson, 2006). Most importantly, student-faculty interactions predict retention and persistence (Hazler & Carney, 1993; Pascarella & Terinzini, 2005), especially among students of color (Hernandez, 2000; Jackson, Smith, & Hall, 2003; Maton, Hrabowski, & Schmitt, 2000). Likewise, research suggests that developing mentoring relationships and experiencing positive out-of-class interactions with faculty predicts increased retention and persistence in science, technology, engineering, and mathematics (STEM) disciplines (Maton et al., 2000; Perna, Lundy-Wagner, Drezner, Gasman, Yoon, Bose, & Gary, 2009; Wai-Ling Packard, 2005) and subsequent graduate school attendance in STEM (Maton et al., 2000; Perna, et al., 2009).

Despite the impact of positive student-faculty interactions on student academic success, most students do not interact with faculty frequently (Cotten & Wilson, 2006; Cox & Orehovec, 2007), and such interactions can be especially problematic for students of color to initiate (Nettles, 1990; Hurtado, Eagan, Tran, Newman, Chang & Velasco, 2011). The hesitancy (or enthusiasm) students experience in seeking out-of-class contact with their professors may be explained by professors' behaviors inside and outside the classroom and the overall ethic of care demonstrated by professors (Hawk & Lyons, 2008; Hurtado, et al, 2011). Hurtado et al.'s (2011),

multi-campus study found a lack of faculty incentive to mentor and engage undergraduates, and even successful underrepresented students do not report contact with faculty until their second or third year of college. Students who were engaged in STEM programs, however, were able to report an ethic of care and faculty concern for them as whole students in particular campus contexts. Professors' behavior in the classroom communicates their accessibility and willingness to interact with students outside of the classroom; students subsequently use these "accessibility cues" in deciding whether, when, and how to interact with faculty (Cotten & Wilson, 2006; Wilson et al., 1974). Yet little is known about how faculty characteristics and behaviors influence the extent to which students believe that their professors demonstrate an ethic of care. Additionally, research has not provided an in-depth examination as to how student-faculty relationships are shaped and what determines the quality of those relationships.

The need for frequent and high quality interaction between faculty and students is especially important in STEM introductory courses, which are notoriously known for their large class sizes and heavy reliance on lecture to deliver course content. As a result, students taking these classes are typically scrambling to take notes during class, confused about course content, and engaged in passive rather than active learning (Bransford et al., 2000; Moore et al., 1996; Handelsman et al., 2004; Hurd, 1997; Seymour & Hewitt, 1997; Williams, Papierno, Makel, & Ceci, 2004). Negative experiences in introductory STEM courses may prompt students to discontinue their STEM studies, as evidenced by high attrition from STEM in the first two years of college (Chang, Cerna, Han, & Saenz, 2008; Seymour & Hewitt, 1997). Faculty who demonstrate an ethic of care (Hawk & Lyons, 2008; Hurtado, et al., 2011) and who appear approachable and accessible can help STEM students overcome the obstacles present during the first years of the college and can thereby increase their chances of achieving success in STEM.

The purpose of this study is to identify the characteristics and behaviors of faculty that demonstrate an ethic of care in introductory STEM courses across multiple institutional contexts, using the perspectives of students and faculty. Specifically, this mixed methods study draws from student and faculty survey data to examine the individual- and classroom-level factors that predict the extent to which students perceive their professors as demonstrating an ethic of care in introductory STEM courses. Data from student focus groups and faculty interviews supplement the survey data with additional context as to how faculty signal their accessibility and how students interpret those signals.

Development of Rapport and Interactional Justice

This study incorporates perspectives from two frameworks – rapport and interactional justice —to understand students' perceptions of faculty's ethic of care. Tickle-Dengen and Rosenthal's (1990) work on rapport illuminates how harmonious relationships are formed and sustained. Interactional justice contends that the quality of interpersonal relationships is determined by the treatment of subordinates by those with authority and emphasizes fair and respectful interactions (Bies & Moag, 1986). These theoretical frameworks, coupled with previous literature on college students, provide a multi-dimensional lens through which we examine the student and faculty characteristics and behaviors that cultivate students' sense of their professors' ethic of care in introductory STEM courses.

Tickle-Degnen & Rosenthal's (1990) theoretical framework for rapport posits that, in general, harmonious relationships between two people – faculty and students in this case —is composed of three essential "interrelating components that have affective and behavioral implications" (p.285). The first component is mutual attentiveness, which is focused interaction that takes place between two people who are intensely interested in what the other is saying or

doing. The second component is positivity, which represents a feeling of mutual liking, friendliness, warmth, empathy, understanding, and genuineness. The third component involves coordination between the participants. That is, participants are mutually responsive and feel that there is balance and harmony in their interactions with one another. Although rapport is structured by the same three components – mutual attentiveness, positivity, and coordination — the importance of each changes over time.

During an initial encounter people typically behave in culturally acceptable ways. At this stage, participants evaluate each other and try to manage the type of first impression they give. Additionally, they rely heavily on using culturally defined ways of communication and behavior. People also typically expect a high degree of warmth of friendliness from the person they have just met. Some degree of awkwardness – low coordination – is expected at this stage. Later, as two people become more familiar with each other and develop stable perceptions of the other, they create new and more varied ways of interacting with each other so that communication and interaction can best fit the needs of the participants. At this point participants should know each other enough to achieve smooth communication and interaction. At either stage, participants expect a high level of mutual attention.

Nonverbal behavior is particularly important in the development and maintenance of rapport because it communicates important messages about a person's positivity (e.g., their warmth, friendliness) and attentiveness (interest in the other person). Particularly, in the early stages of interaction, "each individual would be watching the other for cues that signaled whether or not approach and continued interaction were desired [from the other person] and, simultaneously, would be deciding whether or not approach and continued interaction were desirable [to the individual]" (p.288).

Tied to Tickle-Dengen and Rosethal's (1990) work on rapport is the framework of interactional justice (Bies & Moag, 1986; Folger & Bies, 1989; Lomo-David & Hulbert, 1992). Interactional justice originates from the organizational justice and organizational theory literature and focuses on the quality of interpersonal relationships (Cropanzano, Prehar, & Chen, 2002). The presence of interactional justice occurs when those with authority "treat individuals with personal dignity…" (Cropanzan, Prehar, & Chen, 2002, p. 326). When individuals feel respected, they typically score higher on performance measures and demonstrate a stronger commitment to the organization (Buttner, 2004). Furthermore, the occurrence or presence of interactional justice cultivates relationships of trust between those with authority and their subordinates (Masterson, Lewis, Goldman, & Taylor, 2000).

Although management, labor, and organizational scholars first offered the tenets of interactional justice (Bies & Moag, 1986; Folger & Bies, 1989), a handful of higher education scholars have applied the framework to better understand the relationship between students' perceptions of interactional justice and their subsequent performance in the classroom (Buttner, 2002, 2004; Lomo-David & Hulbert, 1992). Buttner (2004) examined whether students perceived their instructor to be respectful, with respect being determined by an instructor's responsiveness, recognition, and treatment of students in addition to their classroom integrity. Students perceived instructors to be more caring when they listened to students' concerns, expressed sensitivity to students needs, affirmed students' contributions to class, and treated students with respect and fairness (Buttner, 2004).

Accessibility Cues and Ethic of Care

A study by Wilson and colleagues (1974) suggests that the behavior of professors in the classroom communicates to students the professors' accessibility outside of the classroom.

Students subsequently use these cues to form their beliefs about whether their professor cares about them and is open to out of class interactions (Wilson et al., 1974). Not surprisingly, these beliefs influence the probability that the student will initiate contact with faculty (Cotten & Wilson, 2006; Snow, 1973; Wilson, et al., 2011) and may help explain why some professors report frequent interactions with students while others do not.

Accessibility has both a physical and psychological dimension. Physically it refers to the tangible *availability* of professors outside of class and the ease or difficulty students have when trying to reach faculty (Granitz, Koernig, Harich, & 2009). Psychologically it refers to the professors' attitudes, beliefs, and values regarding personally interacting with students and their receptivity to giving guidance to students or talking with them about questions or concerns outside of the classroom (Faranda & Clarke, 2004; Gaglio, Nelson, & King, 2006; Wilson et al., 1974). Indeed, a professor may "be available to students without being truly 'accessible' to them in the sense of being willing and even eager to listen, to exchange ideas, and to help if he can" (Wilson et al., 1974, p. 82). In other words, it is important for students to perceive that their professor genuinely cares about them and wants to help them learn both in and out of the classroom (Gall et al., 2003).

By implication faculty accessibility goes beyond delivering technical information to students and includes forming a positive personal or social connection with students (Gall et al., 2003; Vesilind, 2001). Hult (1980) emphasizes the need for pedagogical caring in which instructors recognize students as individuals and treat students with respect. A lack of an ethic of care may explain why students in STEM disciplines commonly describe STEM faculty as "cold," "intimidating," "inaccessible," and "unapproachable" (Seymour & Hewitt, 1997; Vogt, 2008).

For students to actively seek out guidance from their professors, they must "be reassured that their inquiries are welcome and that they will be taken seriously" (Cotten & Wilson, 2006, p. 508). In reflecting about his experiences with students, Fairchild (2005) finds that the best ways he communicated accessibility and caring was by having an open door policy, allowing students to contact him at home, responding to questions or concerns within 24 hours, being punctual for meetings, conveying courtesy and communicating respect in his interaction with students, and encouraging students to drop by his office for informal conversations. Professors can also communicate psychological availability by exhibiting patience when a student does not understand something and by being willing to help with course-related questions (Buttner, 2004).

A positive faculty-student relationship can increase students' willingness and confidence to contact professors outside of class (Granitz et al., & 2009) and may result in more interactions (Benson et al., 2005). Faculty members appear to create more positive relationships with their students when they show an interest in them, give them their full attention (O'Neill & Todd-Mancillas, 1992), treat them as individuals (Hawk & Lyons, 2008; Hult, 1980), and try to get to know them personally (Buttner, 2004; Campbell & Davis, 2006). Professors who listen to students' concerns (Buttner, 2004) and are able to empathize (Beck, Daughtridge, & Sloane, 2001) or demonstrate sensitivity to unusual personal situations (Buttner, 2004) also appear to have better relationships with their students. Indeed, first-year STEM students initiate contact with their professors more frequently when they believe that their professors care about them as demonstrated by faculty concern over students' academic and personal welfare (Benson, Cohen, & Buskist, 2005; Hurtado, et al., 2011;). Scholars have introduced the notion of an ethic of care in teaching (Owens & Ennis, 2005) based on feminist work (Noddings, 1984) that indicates such a philosophy should be at the heart of education but instead relationships are undervalued.

Feminists scholars have suggested that an ethic of care arises out of sense of duty and to justice, but such a moral concern for students should not come at the risk of one's autonomy to achieve career goals if the individual is subject to unequal treatment, nor should such a concern be limited in this case to women faculty (see critiques of the ethic of care Hassan, 2008).

Instead, there are many ways that faculty convey a lack of care. When professors constantly appear hurried (O'Neill & Todd-Mancillas, 1992), fail to respond to questions asked in class or via email (Buttner, 2004), are not available during office hours (Buttner, 2004), or miss meetings with students, they send important messages about their ethic of care and accessibility (Hawks & Lyons, 2008). Such behavior can also make students feel unimportant. Furthermore, some faculty behaviors can, whether intentionally or not, intimidate or embarrass students and deteriorate the faculty-student relationship. For example, "instructor rudeness, arrogance, condescension, ridiculing, sarcasm, cutting students off, and putting students down in front of classmates" decreased student motivation, class attendance, and participation in one study (Buttner, 2004, p. 327). It is not surprising that some students drop a class altogether to avoid further interaction after finding a professor to be disrespectful (Buttner, 2004).

Relating Students' Perceptions of Care to Interaction with Faculty

A number of personality and interpersonal skills seemingly contribute to students' perceptions that faculty are accessible and care about their well-being. Previous research suggests that students have a better relationship with professors who are empathetic and credible (Nadler & Nadler, 2001), have a sense of humor (Cotten & Wilson, 2006) and a good personality (Benson, Cohen, & Buskist, 2005), and do not mind personal disclosure (Cotten & Wilson, 2006). In general faculty friendliness contributes to more interactions between students and faculty (Einarson & Clarkberg, 2004; Wilson et al., 1974).

The personal values and beliefs faculty have about their role as institutional agents also relates to student-faculty interaction. Professors who believe they play an important role in students' college experience (Golde & Pribbenow, 2000; Wilson et al., 1974) and value getting to know students personally (Wilson, Woods, & Gaff, 1974) tend to report having more interactions with students out of class. Likewise, highly valuing teaching (Cotten & Wilson 2006; Einarson & Clarkberg, 2004; Golde & Pribbenow, 2000; Gaff, 1973) and believing that learning is a dynamic process between the instructor and student (Wilson, Woods, & Gaff, 1974) portends more frequent student-faculty interaction.

Overall, many students simply do not feel comfortable enough with faculty to approach them outside of class for non-class related questions (Cotten & Wilson, 2006). Others report not knowing why or how to initiate discussions outside of the class (Vianden, 2006). Students who are in their first year of college, particularly those who are unfamiliar with the norms of college life (i.e. first generation college students) or have low self-confidence, may be especially intimidated by faculty and find interacting with them uncomfortable (Cotten & Wilson, 2006; Kuh, Kinzie, Schuh, & Whitt, 2005).

Methods

To understand the characteristics and behaviors of students and faculty that influence students' perceptions of faculty members' accessibility and ethic of care, the data are drawn from a larger, multi-phased project focused on introductory STEM courses, wherein we utilize a sequential exploratory mixed methods design. This design consisted of collecting, analyzing, and integrating quantitative and qualitative data during the research process (Creswell, 2005; Teddlie & Tashakkori, 2009). In this study, the rates of participation in the quantitative survey informed the selection of the institutions for the qualitative interviews, and we fully integrated the

quantitative and qualitative phases in the results and discussion sections (Creswell & Plano Clark, 2011). The methods sections below provides an overview of the approaches utilized in this study; for a more complete description of the methods, refer to Gasiewski et al. (2012).

Quantitative Methods

Data and sample. During the spring of 2010, we administered pre- and post-surveys to students enrolled in introductory STEM classrooms across 15 colleges and universities in the U.S. Students completed the pre-survey at the beginning of the academic term and responded to questions related to their STEM commitment, high school preparation, and the frequency with which they articulate and apply scientific concepts. The post-survey, administered at the end of the academic term, included a number of follow-up items related to scientific commitment, articulation and application of scientific concepts, and experiences in and perceptions of their introductory STEM courses. Faculty teaching these courses also completed a survey at the end of the academic term, and this instrument collected information about the pedagogical strategies faculty used in their introductory STEM courses, their perceptions of the students who enrolled in their introductory courses, and their opinions about institutional support. Each of the 15 campuses included in the study provided access to an average of five introductory STEM classrooms, including introductory biology and chemistry courses. Our analytic sample included 3,205 student respondents and 76 faculty respondents.

Variables. The dependent variable for this study represented the extent to which students perceived that the faculty teaching their introductory STEM courses demonstrated an ethic of care. We derived this outcome using principal axis factoring with promax rotation. Factor loadings are provided in Table 1. The Cronbach's alpha for the ethic of care factor was 0.88, which exceeds the recommended minimum threshold for the social sciences (Pedhazur &

Schmelkin, 1990). The items comprising this factor included students' agreement that faculty provided feedback, cared about students' well-being, encouraged students to ask questions, valued students' diverse life experiences, appeared open to viewpoints different from his or her own, effectively handled controversy in the classroom, and was sensitive to multicultural issues in the classroom. These items correspond closely with those examined in Buttner's (2004) qualitative study of the characteristics and behaviors of faculty that cultivated feelings of respect and dignity among students.

The statistical model accounted for a number of student characteristics, student experiences, and faculty behaviors. We included demographic characteristics of race (underrepresented racial minority versus White/Asian American) and gender, as prior research demonstrates that URM students and female students may be acutely aware of a lack of sensitivity or care from faculty (Buttner, 2004; Suarez-Balcazar, Orellana-Damacela, Portillo & Andrews-Guillen, 2003). Additionally, we included measures of high school preparation (e.g., high school biology grade, having taken honors chemistry in high school) and self-rated communication ability, as students with weaker preparation or communication skills may be more susceptible to insensitive faculty (Cotten & Wilson, 2006).

We also examined the relationship between students' perceptions of the ethic of care demonstrated by faculty and students' course experiences, including how often they felt bored, confused, excited about learning new concepts, comfortable asking questions in class, and engaged in class. Additionally, the model incorporated the extent to which students received feedback that helped them learn, had clear expectations from faculty, and sensed that the course emphasized applying concepts to new and practical situations. Indeed students may believe that faculty have a deeper commitment to their learning and development when faculty clearly

communicate expectations or provide feedback to students and engage students in a way that gets them excited about course content (Buttner, 2004; Cotten & Wilson, 2006). Finally, the model included specific faculty behaviors, such as the extent to which faculty provided feedback to students, encouraged collaboration among students, and believed unqualified students were enrolled in the course. Providing feedback and incorporating collaborative activities may signal to students that their instructor has a commitment to teaching and helping students understand course material (Wilson et al., 1974). Appendix A has a complete list of the variables included in the analyses and their coding schemes.

Analyses. Hierarchical linear modeling (HLM) was the primary quantitative analytic technique informing this study. Our data had a clustered structure, with students nested in classrooms, and HLM accounted for this specific design effect (Raudenbush & Bryk, 2002). By accounting for the homogeneity of errors within groups, HLM helps to avoid making a Type-I statistical error of falsely concluding the significance of a parameter. To justify the use of HLM, the outcome variable must vary significantly across classrooms. The intra-class correlation coefficient (ICC) from the fully unconditional model for the factor representing students' perception of faculty's ethic of care was 0.16, indicating that 16% of the variance in the outcome variable is attributed to differences across classrooms.

Qualitative Methods

Data and sample. Based upon response rates in the quantitative portion of our study, we purposefully selected eight institutions at which we conducted interviews and focus groups with faculty and students. In total we conducted 41 student focus groups, one faculty focus group, and 25 faculty interviews during the 2010-2011 academic year. The institutions included one Hispanic Serving Institution (HSI), one Historically Black College or University (HBCU), and

six predominantly White institutions (PWI). Control divided evenly between public and private institutions. Gasiewski et al. (2012) provide more information about the characteristics of these institutions. When reporting student or faculty quotes we include institutional descriptors of geographic location, public versus private, and Carnegie classification to provide some context for the institution.

Of the 241 student participants, 14% identified as African Americans, 54% White, 8% Latino/a, 21% Asian American, and 3% Native American; 62% were women; 42% were freshmen, 33% sophomores, 18% juniors, and 1% seniors; 30% described themselves as pre-med, while another 4% described themselves as pre-dental. Participants in the focus group were either currently enrolled in or had recently completed an introductory STEM course; many of the focus group participants had taken part in our quantitative survey. During the focus groups we asked students to describe their experiences in introductory STEM courses. Questions centered upon student motivation, course structure, learning, instruction, and assessment.

We conducted faculty interviews during the same time frame as the student focus groups. We invited every faculty member who completed the faculty survey to participate, and 26 faculty members agreed to be interviewed. Ultimately we interviewed between three and six faculty members at each institution. Participating faculty members taught introductory courses in various disciplines including chemistry (n=10), biology (n=9), mathematics (n=5), physics (n=1), and engineering (n=1). Teaching experience ranged from two to forty years. Through a series of seven main questions and corresponding probes, we asked faculty participants to describe their experiences teaching introductory STEM courses including goals and objectives, pedagogical approaches, student challenges, institutional support for teaching, and ways of identifying scientific talent.

Analysis. A semi-structured protocol was utilized in both the individual and focus group interviews thus allowing us to respond "to the situation at hand, to the emerging worldview of the respondent, and to new ideas on the topic" (Merriam, 1998, p.72). Prior to the interviews, student participants completed a brief biographical questionnaire, which gathered information on a range of relevant background characteristics which provided us with important student attribute data (e.g., demographic information, educational attainment, and research experience). All interviews were digitally recorded, transcribed verbatim by a professional transcription company, checked for accuracy, and loaded into NVivo8 qualitative software.

In order to develop the coding architecture in NVivo, each transcript was open coded by our team of six researchers by examining the raw data and identifying salient themes supported by the text. This constant comparative approach followed an inductive process of narrowing from particular text segments to larger themes. Thematic coding resulted in inter-coder reliability ratings that consistently ranged between 80% and 85% (Miles & Huberman, 1994). Following inter-coder reliability exercises, the coding structure was re-validated and we were able to add new codes and sub-codes as needed. Queries were then run linking key quotes with participant attributes.

Findings

Table 2 provides the results from the HLM analyses. Two of the four faculty- or classroom-level variables significantly predicted students' perceptions of faculty's ethic of care in introductory STEM courses. Students in classrooms where faculty routinely provided students with written feedback concerning their progress in the course tended to have significantly more favorable views regarding professors' ethic of care. By contrast, students enrolled in introductory

STEM courses with faculty who felt strongly that they had unqualified students in their courses expressed concerns that their professors lacked an ethic of care.

The student-level findings suggest that demographics and pre-college characteristics significantly predicted students' perceptions of faculty members' ethic of care. Female students had significantly stronger feelings than their male counterparts that faculty demonstrated an ethic of care in introductory STEM courses. URM students perceived significantly less care from faculty compared to their White and Asian American classmates, which supports prior research that racial minority students may be more perceptive of uncaring faculty or actually receive differential treatment in classrooms (Buttner, 2004; Suarez-Balcazar, Orellana-Damacela, Portillo & Andrews-Guillen, 2003).

Students who earned higher grades in high school biology perceived faculty as demonstrating a significantly stronger ethic of care, which connects with Cotten & Wilson's (2006) finding that students with weaker academic abilities may have greater susceptibility to insensitive faculty. By contrast, students who had taken an honors or upper-level chemistry course in high school indicated significantly weaker scores on their perceptions of faculty's ethic of care. A possible explanation may be that honors students experience a shock in lack of "special treatment" and less intimate classroom relationships in the transition from high school to college, as high school honors classes are typically much smaller than the large lectures typically founds in introductory STEM courses. As a result, honors students or advanced chemistry students may feel disconnected from their introductory STEM course instructors. Although our qualitative data cannot directly speak to these demographic or pre-college characteristics as they relate to student perceptions of faculty's ethic of care, two recurring

themes emerged from student focus groups related to these perceptions of care: students placed great importance on faculty caring about their personal well-being and about their learning.

Caring About the Well-Being of Students

When faculty expressed concern for students' personal well-being, such concern helped students to feel more connected to the professor and to the course. Gracie explained how she preferred being cared for as a person first and as a student second:

> I have to feel like I'm cared for, not necessarily that I need to learn. If the professor shows that, oh, you were sick one day. "Oh, well, how are you?" or "You seem like you didn't do too well on the last test or something. Did something go wrong with you?" or kind of stuff like that…More about caring about me as a person more than a student. (Western Private Masters University)

Similarly Jeremy noted the importance of professors caring about students personally rather than merely expressing interest in how they mastered course content:

> So, he'll go and he'll be like, "How's your day going? How's your life going?" One of his phrases is like, "How's your happiness level right now with this?" So I mean, it's not like just -- how's the math going. It's, "How are you as a person?" (Northeastern Private Master's College)

Students felt faculty genuinely cared about them when they took an interest in getting to know them. On a minimal level, students wanted faculty to recognize them. Students implied that faculty can strengthen their connection to students and exhibit care simply by recognizing students' faces and addressing them by name.

> On our first recitation [the professor] called each one of us up and was like, "I connect names with stories so tell me your name and tell me something about you," and then by the second recitation class he knew everyone's name. He actually took the time out of his daily schedule and he went home to really, really understand who each of us were, first name, last name out of his over 150 students... it was amazing that he actually cared to do that while it was such a big lecture, and I wouldn't have expected that. (Scott, Northeastern Private Master's College)

Students not only recognized faculty's efforts to get to know them but genuinely appreciated the time they spent learning about their stories. These efforts underscored faculty's genuineness in their interactions with students, which cultivated a stronger sense of rapport between faculty and students (Tickle-Dengen & Rosenthal, 1990). Alternatively, when professors did not try to remember who students were, it sent an important message to students about how much they mattered to faculty.

Faculty, too, recognized numerous benefits to learning students' names. According to faculty narratives, knowing students' names eliminated anonymity and pushed students to be better prepared for class. Faculty felt that "knowing somebody's name actually brings that person closer as well" (Professor Shephard, Southwestern Public Research University). Knowing students by name was the first step in establishing a relationship for many professors, as addressing students by their name "breaks down the learning barrier" (Professor Burke, Southwestern Private Research University).

Beyond getting to know names, many of the faculty we interviewed understood the importance for them to spend time establishing real relationships with their students. Faculty who reported having "extraordinarily good relationships with students," spent a great deal of time learning information about their students, which also demonstrated their investment in and attentiveness to students (Tickle-Dengen & Rosenthal, 1990). Professor Shephard from Southwestern Public Research University explains:

> In semesters where I have time, I'll do an extra meeting at the coffee shop that's totally optional and it's not about the course. It's just about, "Come see me and tell me the other interesting things about your life." 'Cause that's one of the hard things about teaching these large classes is I don't get to know them all. I only get to know actually a small fraction.

By making time outside of class and, particularly, outside the institution to meet with students, faculty demonstrate to students their concern for students' overall well-being by coordinating their interactions with students to best suit students' needs (Tickle-Dengen & Rosenthal, 1990).

Caring about Student Learning

Students also wanted faculty teaching introductory STEM courses to be responsive to their learning needs. Elena at Southwestern Public Research University remarked on the conscientiousness of some of her STEM professors:

> Each math professor I've had ....really seem to care about your grades, and I've gone in for office hours and they were just incredibly helpful. I just really enjoyed the class, and they seemed like.... they'll pretty much do anything to help you succeed.

As Elena illustrated, students easily identified professors that seemed to be especially interested in their performance. These professors commonly exerted a great deal of effort to ensure that students obtained the help they needed to master course content:

> He really cares that you learn the material, and he will do almost anything to help you learn it like time-wise. He'll spend enough time, which is really rare. I had a really good Chem II teacher who would take evenings out and have his students – this was over the summer even, and the students would come in the evenings and he would just work through problem after problem. So it just, it really showed that he cared. (Kate, Southwestern Private Research University)

For many students, the amount of time a professor spent answering questions and helping students better master course content proportionally signaled how much the faculty cared about them and were invested in their learning. In talking about her introductory STEM course instructors, Sammy, a student from Western Private Masters College, explained, "I can tell [my professor] was actually concerned whether the students were learning or not. That's how I can tell she cares."

Faculty seemed to make a sincere effort to be available to students, especially during exam week, so that students could get the help they needed to be successful in their class. Some professors doubled the number of office hours they were required to have by their department. Many faculty welcomed spontaneous visits by students and were happy to answer questions or chat. Dr. Cortez at Southeastern Private Master's College expressed, "If my door is open and I'm here, they can come in." Several students took advantage of their professors' willingness to talk. Alani from Western Private Master's College described her approach to seeking academic help and the important role that care played in her willingness to seek help from her professors:

> I don't even really look at the office hours anymore. I just go and see if they are there and the door is open. I've never had anyone turn me away. I always ask, "Do you have a minute?" They're always are willing to meet with me. It's just all of the professors here really care about their students, because it's a teaching university.

Faculty who frequently held office hours, were willing to meet before or after class, or who were responsive to emails or messages on Facebook were perceived favorably by students as more caring. By being responsive and available to students, faculty signal their willingness to be attentive to students' needs (Tickle-Dengen & Rosenthal, 1990).

Students gained respect for faculty when they expended energy on helping them succeed academically. Mutual respect provided a fertile ground for the growth of strong rapport between student and faculty (Tickle-Degnen & Rosenthal, 1990). However the opposite was also true; students believed that their professors did not care about them when they were not accessible due to limited office hours or due to an unwillingness to be flexible about meeting times. Not surprisingly, students stopped asking for help from professors who were continuously unavailable. In such cases students expressed sentiments similar to Tilly's:, "Okay, well, I might

as well just not even try with that professor [and instead] just do it on my own as I've been doing." (Southeastern Public Research University).

Classroom Behaviors and Characteristics Demonstrating an Ethic of Care

Class discussion. The results in Table 2 demonstrate that students who felt more comfortable asking questions in class, felt engaged in class, and indicated that professors more frequently relied on discussion as a pedagogical tool tended to perceive a significantly stronger ethic of care from the professors teaching their introductory STEM. Additionally, quantitative findings suggest that the significant, positive relationship between feeling comfortable asking questions in class and students' perceptions of faculty's ethic of care was enhanced in classrooms where faculty actively encouraged collaboration among students. Respondents who felt more confident in their communication abilities perceived that faculty demonstrated a significantly greater amount of care.

Justin, from Southeastern Private Masters University, noted that professors signal their openness to questions and level of care about student learning when they stopped lecture to address inquiries from students. Justin said, "Usually [my professors are] very open. You can really just kind of shout and they'll stop if you really need them to and usually they're glad to go back over it just 'cuz they kind of assume that if one person is confused then usually more are confused, and it's probably true." The professors we interviewed wanted students to ask questions because it gave faculty a good indication of what the average student was thinking and whether they were presenting the material in a way that students understood, but, for students, the way in which faculty received or reacted to their questions significantly influenced students' perceptions of whether their professors cared about their learning.

> Most of my, my professors, they're pretty much approachable like, you know, they always ask us do you have any questions or not, like am I going too fast, do you understand, and we're allowed to like raise your, we're allowed to like interact with him, you know, to show that we understand. (Marc, Southeastern Public Research University)

Faculty's encouragement of student questions not only increases student engagement (Gasiewski et al., 2012) but also reduced communication barriers between faculty and students.

Similarly, faculty acknowledged that by encouraging interaction, they were essentially breaking down barriers that stood between them and their students. Professor Reyes from Western Public Research University explained:

> Getting the students to talk to you in class … and having the other students see your interaction is huge, yeah, and it really helps, rather than just standing up and saying stuff, but stopping and getting that interaction. It's hard to do. It's hard to get them—it's hard to get them to talk, … It's always a challenge.

Although the free exchange of questions and discussion in class does not at first glance appear to be transformative, such interaction considerably enhances the relationships that students have with each other and with their professors. This interaction fosters mutual respect and increased attention, which cultivates a stronger rapport between faculty and students (Tickle-Degnen & Rosenthal, 1990).

Faculty further encouraged classroom interaction and demonstrated their care for student learning by affirming students' participation and validating students' thought process, even if they answered a question incorrectly.

> I try to make whatever answer they say to be the right answer to some question. Does that make sense? I'll say, "That would be true if we were doing this, but now we're doing this, so why is this not true?" I think you can ask without making a student feel—I think they know I care about them. I think they know that I want them to learn....I think they know when I don't let them off the hook it's because I care about them. I'll kinda joke, "This is that tough love stuff. Come on, you can do it." (Professor Alpert, Southwestern Private Research University)

This affirmation of students' questions connects strongly with the tenet of interactional justice (Bies & Moag, 1986; Folger & Bies, 1989). Treating students with dignity and respect when they make themselves vulnerable in the classroom by asking questions or participating in class discussion represents a key way in which faculty can demonstrate to students that they care and appreciate students' engagement.

In a classroom context in which professors respected students as intellectuals and valued their contributions to classroom discussion, students felt more at ease, especially in large classes. Faculty tried to push students to use what they already knew to think questions through for themselves without embarrassing them in the process. To accomplish this feat, faculty provided students with words of encouragement and emphasized their belief in the students' ability to succeed:

> And it's, "No, you can do it." I definitely feel like a cheerleader. I try to take a very encouraging tact [with] them ... You want the student to leave the course with the confidence that they need to ... answer these questions. (Professor Straume, Western Private Master's College)

Although some professors appeared happy to answer student questions or help students work through the process of finding the answer, others exhibited less enthusiasm. According to students, professors commonly rushed through the answers to student questions, simply repeated an explanation that the student did not understand in the first place, or responded in a way that did not answer the question. In these instances, students understandably became frustrated and discouraged. Stewart from Southwestern Public Research University spoke for many students when he said, "It kinda just defeated the purpose of asking the question all together, and you might as well just either give up or try to do it on your own and find somebody else to help you."

A number of students described instances in which faculty avoided clarifying course concepts by directing students to the book or the Internet, which suggested an underlying expectation that students would teach themselves and provided an implicit signal that faculty had less concern for students' learning. Some professors explicitly told students that they should only seek out help from the instructor as a "last resort." In other instances, faculty discouraged questions in class by making the task of asking a question uncomfortable. In such cases, students felt that faculty shamed them for needing more time to understand new course material. Indeed this sort of faculty behavior discouraged student participation and made students feel as though their professors did not care much about their academic growth or learning. Jasmine from Midwestern Public Research University elaborates:

> And then if you, if you ask a question he'll like make you stand up, and explain it to the class. You're like, "Okay clearly if I'm asking a question I don't know what's going on. So why should I explain it to the class?" And so you're just kinda standing up there like really awkwardly, and you like point at something. And obviously you're saying something's wrong. And he's like, "Does anybody have any comments?" And so people would be like, "Yeah that's wrong." And you're like, "Okay let me sit down then. Someone else explain it." Or I don't know maybe you could teach [sarcasm]. So it's like really frustrating.

Jasmine's experience illustrates the absence of interactional justice, as Jasmine felt disrespected when her professor seemed to embarrass her in front of her peers. Rather than try to affirm Jasmine's participation and lack of understanding of course content, Jasmine's professor instead seems to make an example of her in front peers.

When professors responded abrasively to class questions, students perceived them as unapproachable and uncaring. Molly from Southwestern Private Masters University noted:

> I haven't [asked questions] for my science class. I had tried to ask my teacher a question after class one time, and he kinda said it with a attitude, so I was like, "Oh, yeah," not really comfortable asking him a question. And so, if I have any questions, I actually ask

> the person sittin' next to me, like "Okay, did you catch that?"…So, I'll ask the person next to me before I ask the teacher.

This quote reflects the experiences of a number of students in STEM classrooms; poor faculty attitudes toward student inquiries discouraged students and made students want to limit further interaction. For some students, this meant that they stopped using the instructor as a resource and instead relied more heavily on peers. An overreliance on peers (and avoidance of faculty) may explain why students who studied more frequently with students from class perceived faculty as demonstrating a weaker ethic of care (See Table 2).

Although the faculty we interviewed recognized that some students preferred to ask peers for help rather than approach them, they didn't seem to understand the root cause of this behavior. Professor Lloyd from Northeastern Private Master's College explained, "And I think the students were maybe more comfortable going to other students than to faculty. The freshmen seemed to be kind of afraid of faculty. I'm not sure why."

Several professors admitted that they sometimes were unaware when students perceived their behavior as intimidating, rude, or belittling, and they appreciated when students brought such feelings to their attention. Professor Hume from Southeastern Public Research University admitted that there was sometimes a mismatch between how he interpreted his actions and how students perceived them:

> There is a huge gap between the atmosphere that you think you are creating in your course and the atmosphere that you are. I am constantly trying to remember that. I want to have a classroom where my students never feel inhibited about telling me I have just done something wrong or saying, '[Professor Hume], I don't understand you.' I am constantly getting the feedback to my students from my students so I think I am the nicest guy in the world but then I get feedback from my students that I intimidate them in class and they are afraid to point out things and so then I have to back up and apologize, and reiterate that that is not the kind of classroom atmosphere I am trying to build.

Professor Hume's comments illuminate how important it is for faculty to develop rapport with students and maintain a sense of interactional justice in the classroom facilitated by the fair and respectful treatment of students (Bies & Moag, 1986). By reminding students that the faculty-student relationship is dynamic and relies on trust from each party, faculty can cultivate a respectful, open culture in the classroom, and students seem to respond positively to such an environment.

Boredom, Confusion, Excitement, and Engagement in the Classroom. The quantitative findings in Table 2 show that students who reported feeling bored, confused, or overwhelmed by coursework perceived their professor as significantly less caring. By contrast, respondents who reported being excited to learn new concepts or found that their introductory courses emphasized applying concepts to practical problems or new situations tended to feel that their professors demonstrated a significantly stronger care ethic. Likewise, students who reported feeling engaged in their introductory STEM courses, received clear expectations from faculty for the course, and received feedback from faculty that helped them to learn and improve held a perception that their professors more strongly cared for students (see Table 2 for coefficients).

Faculty emphasized the importance of humor and an engaging teaching style to get students excited about learning, prevent boredom, and lessen students' reluctance to approach faculty. Professor Pace from Western Research University revealed, "The secret to teaching is to make it not boring. Math classes inherently are sort of boring, so you have to make jokes and things like that." Some professors even resorted to eccentric teaching strategies in an effort to hold students' attention, encourage participation, and help them learn. Students appeared to respond favorably to these efforts, as Ruby's words illustrate:

> My Stats teacher is like that. He's just not normal. I don't know how to explain him. But the class is fun, I enjoy it, I hardly ever yawn or anything in there, even when I'm just really tired. But it makes me engaged, and it makes me wanna learn, because you know, he's always yelling or -- not yelling at us, but you know, yelling. Just to be weird. But. I mean, it makes it exciting and it makes me say, "Okay," and it actually helps when it comes time for asking questions. I ask a million and one questions in that class, and right after that is my Bio class, and I go in there and I'm just quiet. 'Cuz I mean, I dunno, you have to -- I guess you have to feel that sense of, "Oh hey, yes, I can ask a question." I dunno, but my Stats teacher, I love the class even though I may not always understand the information. I still really enjoy the class because of my teacher. (Southwestern Private Research University)

Having a dynamic and energetic teaching approach proved doubly effective; it not only maintained student interest during class but also made professors seem more personable and approachable. Students especially appreciated when faculty infused enthusiasm into predominantly lecture formatted courses; students interpreted faculty enthusiasm as a demonstration that they enjoyed teaching their topic, wanted to work with students, and desired a genuine connection with students. This energetic pedagogical style facilitated the development of a strong and positive rapport between faculty and their students.

By contrast, students who felt confused more frequently in class or overwhelmed by their introductory STEM courses had significantly less favorable views of their faculty members' ethic of care, which may indicate a possible disconnect between students' learning style and the faculty's pedagogical approaches. Another possible explanation may be that students, after having experienced negative exchanges with their professors, never received the help they needed to gain clarity in the subject matter. Meg, a student at Southwestern Public Research University, confided that one of her introductory STEM professors displayed little to no patience for students when they lacked understanding of course material. In her words, "If we asked a question he would just be like, 'Well, I'm not gonna go back and teach you that.' I even talked to him after class, and he was just like, 'Well, all I can say is read the chapters, get with a study

group, that's all.'" Meg understandably felt especially slighted by her professor given that she reached out to him twice and did not receive the guidance she sought. When faculty were unwilling to address students' needs for additional clarification, students felt disrespected and uncared for by their professor.

By contrast, a number of professors highlighted the importance of being patient with their students:

> I think the first and most important lesson I've learned is to appreciate the difficulty that some students have with the material and to make sure that they don't feel judged for the difficulty that they're having, to express the idea that some of this material is challenging. It's okay to struggle with it, and many people do. (Professor Dawson, Midwestern Public Research University)

Being patient with students meant trying to resist chastising students for asking the same question more than once. It required faculty to try understanding the difficulty that students had learning the material. It meant being forgiving when it took students longer to answer questions or understand concepts. Indeed this was no easy task. Professor Shephard from Southwestern Public Research University explained, "You have to listen to the students and sometimes you just have to walk away and have them come back so that you're not as rude and as mean."

The results in Table 2 show that the negative relationship between students' perceptions of faculty's ethic of care and their feeling of confusion and sense of being overwhelmed was mitigated in classrooms where faculty more often encouraged collaboration among students or spent more time meeting with students during office hours. More positive classroom environments and course-related out-of-class experiences mitigated the negative effects of feeling bored or confused on students' perceptions of faculty's ethic of care.

Office Hours and other co-curricular experiences. Several out-of-class experiences significantly predicted students' perception of faculty's ethic of care. The results in Table 2 show

that students who sought professional tutoring or spent more time attending the office hours of teaching assistants tended to view their introductory STEM professors' ethic of care significantly less favorably. By contrast, students who spent more time memorizing information, cramming for exams, and attending study or review sessions for their introductory STEM courses felt that their faculty exhibited a significantly greater level of ethic of care.

Students felt tremendously more comfortable attending office hours when faculty actively encouraged them to attend. Students especially liked when professors encouraged them to stop by office hours to talk about topics that interested the student, even if such topics were unrelated to the course or school. Although students typically used office hours to discuss course material, many were happily surprised to find that office hours provided them with the opportunity to see a more personable and relaxed side of their professor:

> I've had a lot of professors who don't seem all that great, all that nice in class and seem kind of intimidating, but as soon as you go talk to them you realize, I mean, you see the pictures of their kids on their desks and you realize, you know, you're just humans. And it makes it a lot easier. (Tina, Southwestern Private Research University)

Most students reported that the amount of interaction they had with their professor out of the classroom context depended on the treatment they received from professors during class and office hours. When they saw that a professor was patient, kind, and willing to help they usually sustained contact. Alternatively, students avoided interaction with professors who they described as self-centered, egotistical, rude, and even intimidating.

> I know that he rejected a bunch of students from, from his office hours. Like the first week in a couple of my friends went to his office hours and they didn't understand chemistry, almost at all. And he's looking at you, and he's asking you why you don't know this, and you're trying to ask him for help and he's asking, he's like, "Why don't you understand this? How come you don't understand this simple concept?" And that's not a good thing. And it discouraged a bunch of the kids. They dropped the course immediately, and a couple of them stayed but they hated it. And I think he only accepted like one student into office hours, and he yelled at a couple of the kids. And I, I never

> bothered going to his office hours because I didn't like his teaching, and I didn't really want to go there. (Luke, Northeastern Private Master's College)

In such cases, students turned to peers, TAs, and other professors in the same field for assistant with coursework. Karly from Western Public Research University simply said, "I'd rather go to my TA. Less intimidating." These findings suggest that the negative relationship between seeking out tutoring or attending TA office hours and student perception of their professors' ethic of care found in the quantitative analyses likely does not mean that seeking out such services results in students feeling that their faculty exhibit less of an ethic of care. Instead, the narratives suggest than students seek out external academic help after having experienced a negative interaction with faculty which made them feel that the faculty did not care about them. In other words, when mutual attentiveness and aspects of interactional justice (like respect) are absent or lacking in student-faculty interactions, students avoid their introductory STEM course professors and seek alternative avenues of assistance.

Although perceptions of intimidating faculty made students weary of interacting with their professors in introductory STEM courses, several students recognized when faculty exceeded job responsibilities, and students expressed gratitude for additional opportunities to learn course content. They were especially grateful for review sessions, especially when these sessions occurred before exams, because it allowed them to ask faculty lingering questions. These sessions not only helped students to better learn the course material but also helped students establish more meaningful connections with their professors. Madison, a student at Midwestern Research University, was impressed by her professor's firm commitment to students and noted, "She'll hold a review session for not even her class and she isn't paid for it. She stays

from like 5 until like 7:30 on Friday nights and lectures just about what we learned in our Orgo [organic chemistry] class. It's her subject but it's not her class."

Other students shared Madison's sentiment, and appreciated when faculty came to campus on the weekends or stayed late into the evenings to work with students. On some campuses, faculty spent additional time providing supplemental instruction to their students even if an exam was not in the immediate future. Sophia from Western Private Masters University elaborated, "They even come in on the weekends, like you said. There are a lot of teachers who come in on Sunday just to help the kids with lab write ups or just general material, stuff like that." By going out of their way to help students in groups and individually, faculty sent an important message to students about their ethic of care. Bastian from Northeastern Private Master's College described his experience:

> She will sit down with you one-on-one. If you just, all you have to do is just ask her. She'll sit down with you one on one. She'll work through the problem step by step by step until you get it, and if you exhaust – for some reason if you exhaust all the problems inside of our textbook, she'll make up other ones right on the spot and work with you step by step by step until you actually get it.

Students not only appreciated the faculty's time but also were grateful for thorough (and patient) instruction, a chance to apply what they learned to solve problems, and immediate feedback on their performance. Faculty's investment of additional time outside of class to improve students' mastery of course content underscores their attentiveness to students' needs and their willingness to coordinate their interactions with students to meet their needs, both of which represent key components of developing a healthy rapport (Tickle-Degnen & Rosenthal, 1990).

Conclusion

Introductory STEM courses represent STEM majors' entrée into their discipline, and their impressions of these courses and the faculty who teach them shape students' interactions

with faculty and perceptions of the larger disciplinary culture. The cold, intimidating culture of STEM represents one of several reasons why students leave STEM majors in their first two years (Seymour & Hewitt, 1997; Vogt, 2008). By contrast, when STEM students develop healthy relationships with faculty, their likelihood of being retained in STEM (Maton et al., 2000; Perna, Lundy-Wagner, Drezner, Gasman, Yoon, Bose, & Gary, 2009; Wai-Ling Packard, 2005) and matriculating into STEM graduate programs (Maton et al., 2000; Perna, et al., 2009) significantly increases.

Our findings suggest that small changes in student and faculty behavior in introductory STEM courses can significantly improve the rapport between faculty and students. Students emphasized their desire for faculty to exhibit a minimal level of care about them as individuals, and cues as small as learning students' names or asking how they are doing appear to signal faculty's ethic of care to students. Showing an interest in students' lives beyond the classroom demonstrates warmth, friendliness, and attentiveness on the part of the faculty, and these characteristics represent crucial elements to developing strong rapports with others (Tickle-Dengen & Rosenthal, 1990). Large class sizes do not need to impede faculty's efforts to learn more about students or at minimum learn their names, as several faculty in our study described using informal meetings off campus with students or smaller recitation sections of their courses to develop more meaningful connections with students.

An ethic of care emphasizes the value of relationships and one's sense of duty to another; however, efforts to cultivate healthy relationships are not the sole responsibility of faculty, as students have an obligation to take advantage of opportunities to get to know faculty on a more personal basis. Students identified office hours and review sessions as prime opportunities to connect with faculty in more meaningful ways. Likewise, faculty expressed frustration when

students opted not to attend office hours or review sessions where faculty had set aside time to work with and get to know students in their introductory STEM courses. Tickle-Dengen and Rosenthal (1990) discussed the tenet of mutual attentiveness in developing rapport; thus, for faculty and students to cultivate successful relationships, students must provide faculty with the same level of respect and attentiveness that faculty offer to them.

Faculty can encourage students' respect and attentiveness through their verbal and nonverbal communication with students in the classroom. Students who felt comfortable asking questions in class sensed a greater ethic of care from their professors. Professors who regularly encouraged questions and affirmed students' participation in class signaled to students that the faculty welcomed their engagement in and out of class. By contrast, professors who dismissed students' questions, refused to answer questions by referring them to the reading, or embarrassed students when they asked a question demonstrated a significant lack of care about students' learning. Such behavior on the part of the faculty demonstrates a lack of mutual respect and does not promote the tenets of interactional justice (Bies & Moag, 1986; Folger & Bies, 1989; Lomo-David & Hulbert, 1992), leading to decreased engagement in the classroom (Gasiewski et al., 2012). Students consistently described this kind of classroom environment as one that discouraged further interaction with faculty outside of class, which affirmed prior research that students disengage when they sense that faculty do not take their questions seriously (Buttner, 2004; Cotten & Wilson, 2006; Snow, 1973; Wilson, et al., 2011). By contrast, by exhibiting patience with students, professors demonstrated a willingness to help students learn, which connects with Buttner's (2004) work regarding faculty's nonverbal signals to students about their overall care for student learning.

Faculty can demonstrate that they care about students' learning by exhibiting enthusiasm and interest in their teaching. Professors relied on enthusiasm and dynamic pedagogical strategies to engage students and provide a counter to course content that may bore students. Students responded well to these efforts, as students interpreted faculty's energy as a demonstration that they were invested in their teaching. Similarly, professors' enthusiasm made them more relatable to students. Furthermore, students responded favorably when faculty used more examples in class and related course content to practical problems and new situations; such behavior demonstrated to students that faculty had invested thought about the course and strived to make the course more interesting and engaging. This finding underscores earlier work that concluded professors who placed a high value on teaching and understood the dynamic nature of the learning process demonstrated to students that they cared about student learning (Cotten & Wilson 2006; Einarson & Clarkberg, 2004; Golde & Pribbenow, 2000; Gaff, 1973; Wilson, Woods, & Gaff, 1974).

Faculty have an opportunity to think more critically about how their behavior in class and pedagogical style affects students. Although a number of faculty whom we interviewed described going out of their way to address student concerns, others seemed unaware of why students avoided interaction with them. Faculty must recognize the power dynamic in their introductory STEM courses, as many of the students enrolled in these courses are first-year students who may lack the self-confidence to alert faculty to the cues they are sending to students. Considering feedback on course evaluations may help faculty improve their classroom context; however, faculty receive this type of feedback too late to make a difference for some students. Indeed, several faculty we interviewed sought formative feedback from students

throughout the academic term to ensure that they met the diverse needs of students in their introductory STEM courses.

Efforts to improve STEM retention in the first two years of college consistently focuses on introductory STEM courses. Much of this research has examined how faculty's use of active pedagogy increases students' learning gains and improves their likelihood for success in upper-division STEM courses (Prince, 2004; Tagg, 2003). Our findings support that work but also underscore the need for faculty to consider the verbal and nonverbal cues they send students. Affirming student participation in class, investing time in learning more about students, especially their names, and infusing enthusiasm and energy into teaching demonstrates to students a deep level of care about students' personal well-being as well as their academic success. Demonstrating this ethic of care encourages more interaction between students and faculty (Cotten & Wilson, 2006; Wilson et al., 1974) and begins to change the culture of STEM from one perceived as cold and unwelcoming to one of support and engagement. By focusing more than merely on content mastery and considering the classroom dynamic they promote through accessibility cues and their demonstration of an ethic of care, professors in introductory STEM courses have an opportunity to become agents of change in improving STEM persistence and achievement.

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Table 1
Factor Loadings for Perceptions of Faculty's Ethic of Care

Item	Loading
Perceptions of Faculty's Ethic of Care	alpha = 0.88
Cared about students' well-being	0.79
Valued students' diverse life experiences	0.79
Appeared open to viewpoints besides his/her own	0.77
Handled controversy in the classroom effectively	0.77
Was sensitive to multicultural issues in the classroom	0.72
Encouraged students to ask questions	0.69
Gave students written feedback on their performance or progress in the course	0.51

Table 2
HLM Results Predicting Students' Perceptions of Faculty's Ethic of Care

	Coef.	S.E.	Sig.
Background and Pre-College Characteristics			
Sex: Female	0.08	0.04	*
Underrepresented racial minority student	-0.10	0.04	*
HS biology grade	0.07	0.03	*
Took honors or higher chemistry in HS	-0.14	0.03	***
Acting like a scientist	0.04	0.02	*
Tutored another student in math or science courses	-0.04	0.02	*
Communication skills	0.06	0.01	***
Reason for Taking the Course			
Recommended by other students	-0.05	0.02	**
Instructor reputation	0.06	0.02	**
Experiences in and Feelings about the Course			
I felt comfortable asking questions in class	0.14	0.02	***
Encouraged collaboration among students	0.12	0.03	***
Lecture	-0.02	0.01	
Class discussion	0.03	0.01	**
Attended class sessions	0.05	0.02	**
Studying with other students from this course	-0.03	0.01	***
Feelings about the Course			
Confused	-0.05	0.02	*
Encouraged collaboration among students	0.07	0.03	*
Bored	-0.04	0.02	*
Overwhelmed by the workload of the course	-0.07	0.02	***
Time spent meeting with students in office hours	0.06	0.02	***
Competition from other students in the class	0.02	0.01	*
Excited about learning new concepts	0.06	0.02	***
The coursework emphasized applying concepts to practical problems	0.06	0.03	*
The coursework emphasized applying concepts in new situations	0.16	0.03	***
I felt engaged during class	0.07	0.03	**
I received feedback that helped me learn and improve	0.16	0.02	***
I was clear about what was required of me	0.20	0.03	***
Out-of-Class Experiences			
Sought out a professional tutor (not from a campus office or program)	-0.04	0.02	*
Relied mostly on memorization for exam preparation	0.04	0.02	*
Crammed for exams	0.06	0.02	**
Attended review or help sessions to enhance understanding of the content of the course	0.03	0.01	***
Attending TA's office hours	-0.05	0.01	***

Table 2 (continued)

	Coef.	S.E.	Sig.
Instructor Characteristics and Perceptions			
Intercept	-0.01	0.03	
Gave students written feedback on their performance or progress in the course	0.06	0.03	*
Encouraged collaboration among students	0.06	0.05	
Unqualified students are enrolled in my course	-0.11	0.03	***
This institution provides little incentive for me to improve student learning in my classes	-0.05	0.03	