“I Don’t Even Belong In This Class, Bro”: A Framework for Teacher Inquiry into Students’ Sense of Belonging

At the beginning of her fifth year as a high school science teacher, Katelyn, one of the authors, received her Conceptual (C-Level) Astronomy roster for the year. Students deemed in need of additional mathematical support and students labeled as learning English as a Second or Other Language (ESOL) were tracked into C-Level Astronomy. While this had been true in the two years she had previously taught this course, this year’s high percentage of ESOL students surprised Katelyn. Katelyn’s roster consisted of ~60% ESOL students, with a significant number of Hispanic (~47%) and Black (~14%) students, all higher percentages than her school’s population as a whole.

Aiming to support each and every student, Katelyn recognized the importance of building a positive and inclusive classroom culture in C-Level Astronomy. At the beginning of the year, each class began with a meeting aimed at building relationships and setting norms. Katelyn was also cognizant of giving students choice and voice in assignments, designing inquiry-based instruction, and differentiating to meet students where they were.

Yet something felt like it was missing. Based on previous years’ experience, Katelyn’s ESOL, Hispanic, and Black students seemed to not “buy in” to her class,

and more broadly to school. She remembered instances in which students were silent with their arms crossed during class meetings, refused to work with their peers, and skipped class. More often than not, these instances were from students of color, and Katelyn wanted this upcoming year to be different. She wanted every student to feel that they belonged, had a voice, and were valued as individuals, but she wasn't sure how to accomplish this. Furthermore, she worried that all of her students were struggling to be fully present and engaged during virtual astronomy class in the height of the pandemic.

When Katelyn brought this narrative reflection to our inquiry group, her feelings of concern were mirrored by all of us in our own contexts. As a group of five teachers (see Table 1), we had worked together for several years planning and implementing instruction for our International Baccalaureate (IB) Physics courses (see Hartman et al., 2014). We decided to leverage our aligned philosophies of teaching, established group norms, and common time together to transition from a planning group to an inquiry group, using improvement science (Bryk et al., 2015; Carnegie Foundation for the Advancement of Teaching, 2015; Langley et. al., 2009) as our guiding framework. Our first aim was to unpack Katelyn's dilemma: a sense of belonging may not be consistently felt across all student groups.

Table 1

Teacher Profiles

Teacher	Location	Type of School	Years Teaching	Race	Gender
Heather Hotchkiss (Knowles Senior Fellow)	Newton, MA (suburb of Boston, MA)	Public	11	White	Female
Jenny Goetz (Knowles Senior Fellow)	St. Paul, MN	Public	8	White	Female
Kate Miller (Knowles Senior Fellow)	Lima, Peru	Private	8	White	Female
Katelyn Warner	Chesterfield, VA (suburb of Richmond, VA)	Public	6	White	Female
Mark Hartman (Knowles Senior Fellow)	Raleigh, NC	Public	12	White	Male

Note. Location & Years Teaching reported through the 2020–2021 school year.

INSPIRATION & POSITIONALITY

As a group, we engaged in reading Knowles' summer 2020 book selection, Bettina Love's *We Want to Do More Than Survive: Abolitionist Teaching and the Pursuit of Educational Freedom*. We were struck by Love's (2019) concept of homeplace:

> Homeplace is a space where Black folx truly matter to each other, where souls are nurtured, comforted, and fed. Homeplace is a community, typically led by women, where White power and the damages done by it are healed by loving Blackness and restoring dignity . . . "homeplace" is a site of resistance. (p. 64)

As teachers trying to unpack students' sense of belonging, it is important to recognize our group's collective positionality. We are all White and thus members of the dominant racial group in the United States. This racial identity, combined with our own socialization into the racial narratives in science, education, and society more broadly, means that we do not and cannot fully access and understand the experiences of our Black, Indigenous, Latinx and other marginalized student communities. We cannot step outside of our whiteness.

In particular, we are trying to be aware of the sometimes insidious expectation that we, as White educators, know what it will take for our students of color to feel comfortable with academic vulnerability in the classroom—such as sharing unfinished and potentially incorrect ideas. Our own expectations may reflect a White, Eurocentric standard of classroom engagement, potentially disregarding the cultural and linguistic ways of engaging that could better support our students' academic vulnerability and success in the classroom.

We would like to uplift Love's notion of homeplace and the essence of the concept that initially inspired our work. At the same time, we acknowledge that, as White teachers, we cannot fully cultivate all aspects of Love's sense of homeplace for our students, particularly our students of color. As authors, we do not want to co-opt a term that was not intended for us, thus we will move forward with the term "sense of belonging" throughout this article.

In addition, we acknowledge our role as White teacher researchers and education researchers. There are many historical examples of White researchers exploiting communities of color (Tuck, 2009). We recognize this tendency within the field,

and actively fight against this disposition. It is for this reason that we intentionally invite student voices into our inquiry, honoring their insight into their authentic experiences in schools and in classrooms (our own included). It is our hope that, by grounding our work in quotes from students' responses, the reader sees how we bring students in as co-authorities in the inquiry work that we present here. Please note that all quotes reflect students' original grammar and spelling.

FRAMEWORK FOR CRITICAL REFLECTION

To begin our inquiry, we pulled on our experiences as teachers to brainstorm potential barriers to students feeling a sense of belonging in the science classroom. We first brainstormed individually then sorted our ideas as a group, looking for overarching themes that arose within our responses.

Subsequently, we felt it necessary to invite student voices into the conversation. We posed the question: "Not all students feel they belong at school or in science classes. Why do you think that might be?" With 49 student responses collected from three of our classrooms (see Table 2 for classroom contexts), we explored how students' perspectives and teachers' perspectives aligned. This helped us to modify and expand upon the teacher-generated themes to create a more holistic picture (see https://bit.ly/ TeacherAndStudentResponses for teachers' and students' responses sorted by theme).

Table 2

Classroom Contexts for Student Responses

Teacher	Number of Student Responses	Class	Grade Level
Jenny	11	IB Physics Year 2	12th
Mark	18	IB Physics Year 1	11th
Heather	20	Introductory Physics	9th
Total	49		

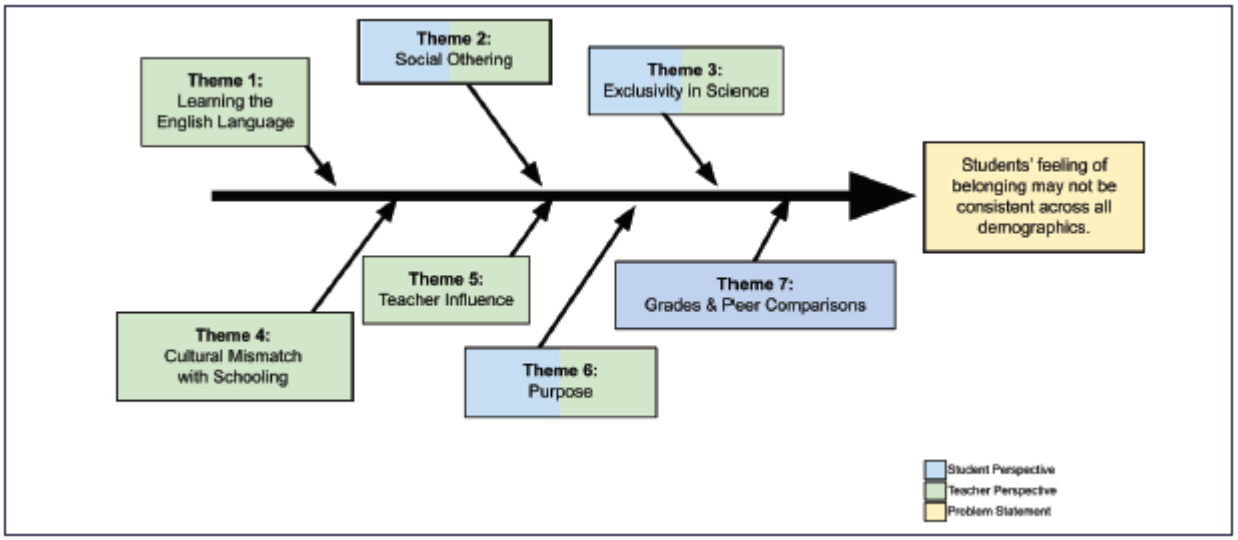
Note. Kate was no longer in the classroom and Katelyn was on maternity leave at the tie of student data collection, thus student responses were collected from Jenny, Mark and Heather's classrooms.

It is important to note that these responses are not from the students in Katelyn's class, as she was on maternity leave and did not have direct access to them at the time. We felt it was important to use student voices and experiences to ground our own initial reflections, and to attempt to disrupt inherent oversights from our White perspectives. We make the assumption that there is some level of transfer of perspectives from Katelyn's class to the other classrooms, not in that the demographic mix is identical, but that leaving out student perspectives at all (even if not an ideal comparison group) would be a mistake.

From these two data sources, we constructed a framework (see Figure 1) to help us map why students may not feel a sense of belonging consistently across all student groups.

Figure 1

Potential Barriers to Students' Sense of Belonging



In what follows, we briefly describe each theme in our framework as well as invite the reader to engage in critical reflection on potential barriers that may exist when considering students in their own contexts. Our intention is not to claim perfect transferability or generality of our own findings, but rather to provide prompting questions that are generative for the reader's own reflection and self-assessment.

THEME 1: LEARNING THE ENGLISH LANGUAGE

Since many students in Katelyn's classroom were ESOL learners, we hypothesized that students may feel excluded from class activities due to language barriers.

Since the class was conducted in English, if students were not comfortable with their English language proficiency, they may have found it difficult to understand and participate fully in activities.

Note that only teacher responses inspired this theme; no students referenced learning the English language as a potential barrier in their responses. This may be due to the fact that few ESOL learners were in our student dataset, or perhaps the nature of our data collection being a written response (in English) prompted by a question (in English). It would be interesting to further engage with students through verbal interviews, perhaps in their home language, to explore students' perspectives around this theme.

To reflect on this theme in your own classroom, ask yourself:

• What language proficiency levels are my students currently labeled as?
• What does my school/district consider ESOL "best-practices?" How do these practices work towards inclusivity?
• What assumptions am I (might I be) making about my ESOL students' potential when it comes to science learning?

THEME 2: SOCIAL OTHERING

This theme refers to the social dynamics that may be "othering" (Kumashiro, 2000) students. Considering the peer pressures that exist in school, formation of cliques, and possible disconnect between in-school Figure 1 Potential Barriers to Students' Sense of Belonging social groups and out-of-school social life, this theme captures the exclusion some students may feel in school and in the classroom.

Approximately 14% (7/49) of student responses contributed to this theme. Notably, two students referenced bullying while two other students referenced mental health. One student's response states, ". . . this feeling may be due to how it may be hard to make some friends . . . ," while another student writes, ". . . students might be facing depression or might be lonely, so they think isolation is the answer."

To investigate this theme in your own context, consider:

• What kind of social groups exist in my school? How are these groups reflected in my classroom?
• Who is seen as a "good" student? A "smart science" student? A "popular" student? How do these various forms of social capital play out in my classroom?
• What am I doing proactively to work towards making my classroom a place where students can and do communicate across social groups?
• What classroom structures can I put in place to help my students connect as humans?

THEME 3: EXCLUSIVITY IN SCIENCE

Another potential barrier to students feeling a sense of belonging in a science class is the exclusivity that is often associated with the discipline and those who do science. Limited representations of scientists in the curriculum, implicit communications of who belongs in science, and ideas about smartness fit here. Most student responses align with this theme. Approximately 22% (11/49) of students reference smartness; for example one student writes, ". . . some students have been told in the past they aren't smart enough, or they can't handle certain classes."

Approximately 12% (6/49) of student responses point to demographic factors and associated stereotypes that exclude marginalized groups from science. One student writes, ". . . if I was the only girl in my science class, I wouldn't feel a sense of belonging. So if people didn't see others that share an ethnicity, religion, etc., they probably wouldn't feel like they belong," while another student writes, "Gender could be a part of it because stereotypically STEM is dominated predominantly by males and race could be apart of it for asian american as the 'dominant' race."

In addition, approximately 12% (6/49) perceived science to be too hard, challenging, or difficult, as seen in one student writing, "I think it's because of the stigma that science is a hard subject . . . "

Finally, approximately 14% (7/49) of students responded that not adequately understanding the science material being taught can lead to a lack of belonging in the science classroom. For example, one student's response says, " . . . because they think they're not good in science . . . and they don't understand the materials as well."

To examine this theme in your own classroom, ask yourself:

- How can I highlight and honor multiple identities in my classroom?
- What reputation does my science course have in my school?
- To what extent do my students assume they can or cannot be successful in a science classroom? Where do these assumptions come from?
- In what ways do I uphold and/or disrupt societal expectations around what it means to be smart or good at science?

THEME 4: CULTURAL MISMATCH WITH SCHOOLING

We recognize a potential mismatch that exists between students' culturally valued ways of knowing and learning and what is traditionally valued in schools. For example, Zaretta Hammond (2014) discusses how many cultures around the world center structured learning in collectivist ways that are very different from the Eurocentric, individualistic culture dominant in American schools. Robin Wall Kimmerer (2013) writes about how indigenous ways of knowing are not recognized as "scientific" ways of knowing. Kimmerer argues both present different but complementary lenses to the canonical ideas which our physics/astronomy classes are typically built upon. This theme considers both outside of school experiences—at home and in the community—commonly referred to as "funds of knowledge" (Gonzalez et al., 1995), as well as previous school experiences, particularly in math and science classes.

Note that this theme only pulls on teacher responses and no student responses aligned here. Perhaps this is evidence of our critical reflection and work around examining systems of oppression that exist in education, something that students may not be exposed to throughout their schooling experience. Alternatively, students may not consider the Eurocentric standards of American schooling to be mutable or may not yet recognize their impact on their sense of belonging in school.

To reflect on potential mismatches with schooling in your context, reflect on:

- How are students placed in this science course? Are there prerequisites to this course? If so, what are the benefits and consequences?
- What funds of knowledge do students bring to my classroom? How do these (mis)match with my curriculum?

THEME 5: TEACHER INFLUENCE

This theme refers to the impact of the teacher's own positionality on the classroom culture, the teacher's biased perceptions of interactions in the classroom, and the pedagogical choices the teacher makes in building a classroom community.

No student responses aligned with this theme. Perhaps this is due to the wording of the journal prompt itself. Students may have been cued to focus only on their

(or their peers') relationship to school, rather than recognizing teachers as part of that system. Additionally, it may be the case that students were afraid to answer honestly when it comes to teacher influence since they knew that their teacher would be reading their journal responses.

To reflect on your own influence as a teacher, answer the following questions:

- How could my own identities (e.g., racial, ethnic, gender, age, linguistic, etc.) influence students' perceptions of me? How do my students' identities influence my perception of them?
- What student behaviors get valued in my classroom? Which do not? Why?
- To what extent do I welcome others' cultures in my classroom community? In science?
- Have I recently reviewed my own actions and thoughts through a lens of privilege and bias?

THEME 6: PURPOSE

The sixth theme captures why students choose to engage in school and specifically in science class. It considers their purposes for taking the course (including student interest) and how connected the topics feel to their current lives and future goals.

Approximately 10% (5/49) of students expressed a lack of interest or disconnect from science, or an overall feeling of "wasted time" in school. One student writes, " . . . I think that some kids do not like school, because they do not see value in the things they are learning . . . " Some students do not see value added to their future lives from the course they are enrolled in beyond achieving the required credits. This theme may have roots in other themes for individual students, such as Theme 4: Cultural Mismatch with Schooling, for students whose cultural ways of being are not valued in the individualistic American classroom, or Theme 3: Exclusivity in Science, for students whose previous science struggles have led them to seek fields where they will not "need" this knowledge.

To investigate this theme in your context, ask yourself:

- Why are students taking this course? How does this course align with their current and future goals?
- How can I bring students' personal interests into the curriculum?
- To what extent am I influencing students beyond the scope of the curriculum?

THEME 7: GRADES & PEER COMPARISON

This final theme was created solely based on student responses, and relates closely to Themes 2, 3, 4 and 6 above, yet feels distinct in and of itself.

Approximately 22% (11/49) of students referenced low grades as a barrier to feeling a sense of belonging in school or in the science classroom. Some students mentioned that the goal of earning a good grade can feel overwhelming or unachievable at times, while other students emphasized grades as a means of comparing themselves to their peers. Some examples of student responses include: “Because school is overwheliming and if you dont get a good grade on something your looked as dumb or lesser than . . . ;” “. . . becuase they feel intimidated by others grades and they feel pressure to meet those high standards;” and “Because I feel like students are constantly being compared to each other and that when you get a good grade, there are those who did way better and it makes you feel like your grade wasn’t good enough. Self esteem is hard to have when you get grades back.”

To examine the impact of grades in your school and classroom, reflect on:
• What values are my grading practices communicating to students?
• How can we partner with students around grading? How can I rethink grading policies to be more authentic and humanizing?
• How can we partner with students around assessment? How can assessments be more authentic and humanizing?

WHERE DID WE GO NEXT?

After constructing our framework, we considered the interdependence that we felt existed between themes. We wanted to design interventions that addressed the root causes rather than the symptoms of a problem.

To identify causes and effects, we used an interrelationship digraph (see https://bit.ly/ Interrelationship-Digraph). Relying on our experience as teachers, we considered each theme in relation to each other theme. We then decided if there was no relation between the themes, or if there was a causal relationship. In the latter case, we decided which theme was the cause and which was the effect. For instance, we considered Theme 5: Teacher Influence as a cause of Theme 3: Exclusivity in Science because we hypothesized that students’ previous experiences with teachers in science, particularly when they are from a different cultural background, could lead to a feeling of mismatch with the people who do science and what is considered smart in science, as many students’ only role models in science are likely to have been their science teachers.

After this process, we counted the number of times a theme showed up as a cause and as an effect. Theme 4: Cultural Mismatch with Schooling, Theme 1: Learning the English Language, and Theme 5: Teacher Influence were categorized as "cause" most often. In comparison, we found that Theme 6: Purpose and Theme 2: Social Othering were categorized as "effect" most often.

Once identifying the causal themes, we considered our locus of control. For us, the causal theme within our locus of control to affect change was Theme 5: Teacher Influence. This helped us focus on changes within our own classrooms, rather than becoming overwhelmed by tackling larger barriers beyond our immediate control in the classroom at the beginning of our work. Therefore, our inquiry group moved forward with ideas for change within Katelyn's classroom centered on Theme 5: Teacher Influence.

We created a journal structure in C-Level Astronomy where students responded to a daily prompt (see Table 3 for brainstormed journal prompts) in a document that Katelyn could read but wasn't shared publicly. We first pushed on teacher-student interactions within the journal structure. Katelyn replied to each student's response in their individual journal documents and Katelyn shared her own responses to the questions with the class as a whole. Based on intentionally elicited student feedback, students identified the journals as an effective way for their teacher to get to know them, and vice versa.

We then shifted to encouraging student-to-student interactions by asking students to share their journal responses verbally or in a written format (through the online chat feature or on a sticky note in a Jamboard). We had limited success as evidenced by students' lack of engagement during these exercises (18% of students shared out loud; one student shared in the chat), which may have been due to the online format of class during the pandemic. This prompted us to reimagine studentto- student interactions. Katelyn anonymously shared (with permission) a few classmates' previous journal responses and asked students to respond to prompts such as: Which of these responses is surprising to you? Which response do you relate most to? Why might they have responded this way? This helped students get to know their peers a bit better, while pushing them to reflect

empathetically on their classmates' experiences.

Based on student responses highlighting a lack of belonging in the science class specifically, we shifted gears once again to focus more on Theme 3: Exclusivity in Science. Aligned with Katelyn's school's required Black History Month activities, we chose to highlight scientists, particularly astronomers, of color (see Presentation: Black History Month; bit.ly/BlackHistoryMonthWarmUps). We intentionally worked to humanize the scientists, not only highlighting their successes and awards, but also providing an overview of their life stories including social obstacles they had to overcome. Subsequently, we repeated this idea with regard to gender, highlighting women in science. Journal prompts pushed students to consider how these scientists felt, what mentors supported the scientists through their careers, and the importance of community to developing a sense of belonging in science. Student responses showed authentic connections between their own lives and the scientists' lives:

In response to the question, *If no one else looks like you in class, how would you feel? How might this affect you?*, one student wrote "I've kind of been in this position before- at my old school in upstate New York my grade was super small, and everyone was white, there were no Hispanics or Asians. There was one black student and then me. I felt out of place sometimes and self conscious."

In response to the question, *How was Dr. George Carruthers' experience [with a lack of role models who looked like him] similar or different to your experience with role models?*, one student wrote, "I also don't really have any role models that are African American. Because they really aren't brought up that much when in class. Most of the time black role models only come up in history class for the civil rights movement."

In response to the question, *What piece(s) of Dr. [Beth] Brown's advice do you agree with?*, following three pieces of advice Dr. Brown gives to students, one student wrote, "I agree with all of her advice. I really agree with 'It's never too late to follow your passions' because for a long time I didn't know what I wanted to do and always thought I was running out of time but soon learned that it's okay to not know everything you want to do in life."

In an end-of-the-year survey, we asked Katelyn's students to reflect on their engagement with the various activities we had tried throughout the year (writing journal responses themselves, hearing Katelyn share her journal responses, highlighting Black scientists, highlighting women scientists, sharing journal responses in the chat, reflecting on other students' responses, etc.). On a scale of 1–5 (5 being the most engaging), responses for each question, on average, were between 3.86 and 4.54 (N=63), leading us to conclude high levels of overall student engagement with the ideas of change we had tried. Perhaps most telling though were students' responses to "My teacher treats all students fairly and with respect" and "My teacher is passionate about teaching and is committed to student learning," where all students surveyed reported a 5.

Table 3

Brainstormed Journal Prompts

• What is your personal definition of "success"?
• What is your dream job after you're done with school?
• At the end of your life, how do you hope others will describe you? / What do you want to be remembered for?
• What do you think your *best* personality trait is? Which of your personality traits do you want to change?
• What do you eat to celebrate something exciting (like a birthday or holiday)?
• Who is your hero and why?
• Among your friends and family, what are you "famous" for?
• What are you most looking forward to in the next month?
• What personality trait of others do you value most?
• What's the best thing that happened to you last week/recently?
• If you didn't have to sleep, what would you do with the extra time?
• How well do you feel like you know [teacher name]? How well do you feel like [teacher name] knows YOU?
• How can [teacher name] get to know you better?
• How do you typically react to challenges/obstacles?
• What motivates you?
• What are you most passionate about?

WHERE CAN YOU GO NEXT?

Once you've critically reflected on each theme in the framework, we invite you to move from awareness to action. This, of course, will look different for each reader in their own, unique context. Below, we present some potential next steps you might take in your context.

First and foremost, we'd encourage you to invite your students' voices into this

conversation around belonging. This could mean having an informal conversation with a small group of students, having a whole class discussion with guiding prompts, or surveying students as we did. Similarly, inviting your teacher colleagues into the conversation can lead to fruitful collaboration, as it has for our inquiry group. Consider bringing up the topic of student belonging in the lunchroom or incorporating it into an existing meeting.
Then, use these new data to reflect:

> Where do your students' responses align with our themes? What new themes arise?
> Where do your teacher colleagues' responses align with our themes? What new themes arise?

We encourage you to modify our framework to match your own analysis.
Next, consider the interdependence that may exist between themes. In moving towards action, it is important to design interventions that address the root causes rather than the symptoms of a problem. To do this, we recommend using an interrelationship diagraph.

> Which of your themes are causal?
> Which of your themes are the effects of other themes?

In addition, it is important to keep in mind your locus of control and opportunities for collaboration.

> Within the causal themes, which are things you can do something about?
> Are there colleagues who might help you engage in this work collaboratively?

CONCLUSION

When students develop a strong sense of belonging in school, they are more likely to have positive attitudes towards school, classwork, teachers and peers; to be engaged and participate in activities; to be invested in the learning process; and have a stronger sense of their own competence (Osterman, 2000). Thus, it is essential for teachers to critically examine and take action towards fostering students' sense of belonging in their school and classroom. Our own inquiry into this topic helped us to better understand and begin to address potential barriers to students feeling they belong in Katelyn's high school astronomy classroom. We hope that you find our framework useful for your own self-reflection and self-

assessment of your students' sense of belonging, and feel empowered to take steps towards addressing barriers that may exist in your context. Change happens incrementally and over time. Tuck & Yang (2018) write, " . . . we can get a false impression that moving between theories of change requires great effort or journeying" (p. 2). They go on to remind us that change comes in "small shifts" (p. 4). With small steps and over time, we can all work towards a more inclusive, more equitable educational experience for our students.

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Jenny Goetz, a Knowles Senior Fellow, teaches physics and astronomy at Harding High School in Saint Paul, Minnesota. You can reach Jenny at jenny.goetz@knowlesteachers.org.

Mark Hartman, a Knowles Senior Fellow, teaches physics and computer science at Millbrook High School in Raleigh, North Carolina. Reach Mark at mark.hartman@knowlesteachers.org.

Heather Hotchkiss, a Knowles Senior Fellow, teaches physics at Newton North High School in Newton, Massachusetts. Reach Heather at heather.hotchkiss@knowlesteachers.org.

Kate Miller, a Knowles Senior Fellow, is a Ph.D. student in Curriculum, Instruction and Teacher Education at Michigan State University. Previously, Kate taught physics in Arlington, Virginia, and in Lima, Peru. Reach Kate at kate.miller@knowlesteachers.org.

Katelyn Warner teaches physics and astronomy at James River High School in Chesterfield, Virginia. Reach Katelyn at katelyn.d.warner@gmail.com.