

Intersections of Active Learning and Instructor Care: Undergraduate Women's Perspectives on Their Instructor's Role in Supporting Their Sense of Belonging in Calculus

Casey Griffin
University of La Verne

One's sense of belonging, or their sense of feeling like an accepted member of an academic community, has been identified as a major contributor to women's decisions to stick with or leave their STEM major. Prior work has examined ways in which pedagogical practices such as providing opportunities for students to engage in active learning in undergraduate courses might influence women's sense of belonging in STEM. However, the focus had been on students' perceptions of the practices themselves rather than the person enacting those practices – the instructor. With this study, I explore ways in which women describe the role their instructor plays in supporting their sense of belonging in an active learning Calculus course. Women's survey responses suggest several ways in which their instructor supported their sense of belonging by portraying care both through their enactment of active learning as well as other pedagogical and personal attributes.

Keywords: calculus, gender, instructor care, sense of belonging

Fewer women than men choose to major in STEM early in their college education (Bressoud, 2023; Eagan et al., 2016), and women leave STEM majors at higher rates than men (Chen, 2013; Seymour & Hunter, 2019). Calculus is a common exit point for all STEM students, but especially for women (Ellis et al., 2016; Rasmussen et al., 2019; Seymour & Hunter, 2019). Their reasons for leaving are not for lack of interest or ability, but rather women, especially those who leave, report feeling a low sense of belonging in STEM (Seymour & Hunter, 2019; Shapiro & Sax, 2011). Prior work has examined ways in which engaging in active learning can support women's sense of belonging in Calculus (Griffin, 2023, 2025). The current study aims to investigate women's perspectives on the role their instructor, rather than the pedagogical practices, plays in supporting their sense of belonging in an active learning Calculus course.

Literature Review & Theoretical Framing

Feeling a sense of belonging has been equated with feeling accepted and valued within a particular environment as opposed to isolated or excluded. Good et al. (2012) studied students' sense of belonging to an academic domain, which they define as "one's personal belief that one is an accepted member of an academic community whose presence and contributions are valued" (p. 701). This definition of sense of belonging (SB) is most relevant to the current study. Feeling a SB has been linked with persistence in STEM (Seymour & Hunter, 2019; Shapiro & Sax, 2011), however women are less likely than men to develop a strong SB (Good et al., 2012; Rainey et al., 2018; Seymour & Hunter, 2019; Shapiro & Sax, 2011).

One major factor that can influence one's SB in an academic domain is the classroom learning environment. The learning environment consists of several features, including (but not limited to) the physical space, the ambience or climate, and learning opportunities (Evans et al., 2009). Researchers have identified links between the types of learning opportunities instructors provide, the ways in which instructors portray care, and students' SB (Fraser, 1998; Griffin, 2021; Lahdenperä & Nieminen, 2020; Rainey et al., 2019).

Active Learning

The pedagogical contexts of the learning environment, such as the learning opportunities the instructor provides during class, have been shown to influence students' engagement and persistence in STEM. Over the last few decades, there have been efforts to reconsider traditional modes of undergraduate STEM instruction to work toward improving student engagement, performance, and retention (Chickering & Gamson, 1987; Freeman et al., 2014; Mesa et al., 2015; PCAST, 2012), specifically by providing opportunities for students to engage in active learning (i.e., during which students have the opportunity to do or talk about mathematics during class rather than passively listening and taking notes while the instructor lectures).

Some research has indicated that engaging in active learning can support students', especially women's, SB, engagement, performance, and retention (Griffin, 2025; Aji & Khan, 2019; Freeman et al., 2014; Fuchs & Sahmbi, 2024; Lahdenperä et al., 2019; PCAST, 2012; Rasmussen et al., 2019; Theobald et al., 2020). However, the benefits of active learning may depend on its enactment (Deslauriers et al., 2019; Johnson et al., 2020). Johnson et al. (2020) found that the instructors in an active learning class posed conceptual questions to women at lower rates than men and highlighted women's contributions less frequently than men's contributions, which they suggest may have contributed to men outperforming women in the course. Meanwhile, participants in Rainey et al.'s (2019) study reported feeling more cared for by their instructor in an active learning environment. And as previously reported in Griffin (2025), women found that interactive learning opportunities like group work supported their feelings of belonging. Therefore, given its potential to influence women's experiences, active learning classrooms provide a rich context in which to explore women's SB.

Instructor Care

The notion of caring has been equated with concepts such as compassion, empathy, and helping (Eisenberg, 1992; Ferreira & Bosworth, 2000; McCroskey, 1992). Care is relational, meaning there is always someone who is doing the caring and someone who is being cared for (Noddings, 1984, 1992). Thus, when considering instructor care, it is necessary to identify ways that students perceive care from their instructors; otherwise, the caring relation (Noddings, 2005) is not complete. Straits (2007) noted that there are elements of instructor care that are learning-centered (i.e., emphasizing content mastery and higher-order thinking) and learner-centered (i.e., emphasizing mutually trusting and respectful relationships). Researchers have identified several ways that students perceive that their instructors care about them and their learning, including learning-centered portrayals of care like involving students in lessons, checking for comprehension, providing help to students, being available to students; as well as learner-centered portrayals of care like establishing a safe and encouraging learning environment, showing a personal interest in students, and reflecting a kind disposition through actions, recognizing students' learning differences, and preparing lessons and enacting them with enthusiasm (Bandura & Lyons, 2012; Garza, 2009; Straits, 2007).

Scholars have identified links between students' perceptions of instructor care and their SB (Cheng, 2004; Rainey et al., 2019). Cheng (2004) studied factors that influence undergraduate students' sense of campus belonging and found that students' feelings of being cared for contributed directly to their SB. Further, Rainey et al. (2019) found that students who felt they belonged in STEM were more likely to report their instructors cared about them than students who did not feel like they belonged in STEM. Thus, demonstrating care to students might be a way instructors could support their students' SB.

Purpose & Methods

Prior work (Griffin, 2023, 2025) has shown that women in this study found engaging in active learning to be supportive of their SB. However, as discussed in Johnson et al. (2020), active learning can have a negative impact on students' experiences depending on its enactment. The purpose of the current study is to explore women's perspectives about the role their instructor played in supporting their SB in their active learning Calculus class, thus placing more emphasis on the instructors than on the active learning practices they employed. For this study, I focus on women's experiences without comparing them to men's experiences because women's experiences are worthy of study in their own right (Du Bois, 1983; Kitzinger & Wilkinson, 1997). The current study is qualitative in nature with open-ended survey responses being the primary source of data.

Research Context

This study was conducted at a midsized, mid-Atlantic R1 public university during the 2022-2023 academic year. The university offers a two-semester Integrated Calculus course as an alternative to the university's standard one-semester Calculus course for STEM majors. The course and sample have been described in detail in prior work (Griffin, 2023; Griffin et al., 2023). Students enrolled in the course are typically first-year students who have declared or are considering a STEM major.

The course was designed to incorporate frequent opportunities for students to engage in active learning. The course is highly coordinated in that instructors teach from collaboratively designed lesson plans, which include recommended active learning opportunities. Specifically, instructors follow a cycle of brief lecture, followed by students working on problems in groups or individually, followed by whole-class discussion. While the course was designed to incorporate opportunities for active learning, students do not know that upon enrolling.

Data Collection and Analysis

At the time of study, there were two sections of the course offered, taught by two different instructors, both committed to active learning. There were 63 and 64 students enrolled in each section. Students enrolled in the course were invited to complete a survey via email during the first week of the course. Those who completed the initial survey were asked to complete a survey during Weeks 21 and 28 of the year-long course (i.e., middle and end of spring semester). The survey included an item asking participants to respond to the following prompt in an open-ended response box: "Give 1-2 examples of what your instructor has done that has impacted your SB (either positively or negatively). If your instructor has had no impact on your sense of belonging, give 1-2 examples of what they could do to support your sense of belonging."

To analyze the open-ended descriptions, I read all the responses multiple times and recorded emerging themes. It became apparent that instructor care seemed to be an overarching idea conveyed by participants. This inspired the use of student perceptions of instructor care as potential codes, while still allowing other themes to emerge. With the instructor care literature in mind, I clustered responses by theme and read them multiple times to determine subcategories of responses within each larger theme. The larger themes and subcategories together comprised the codebook, which was used to code all responses. Data that could not be coded with the codebook were identified and analyzed to determine whether they represented a new category or a subcategory of one of the pre-existing codes. I engaged in an iterative process of coding the data and revising the codebook four times. Each code was binary, and each response could be assigned multiple codes. To achieve reliability, 10% of the responses were coded with three

colleagues not involved in the study. Together, 78% interrater reliability was achieved. Once reliability was achieved, I coded the remaining responses a final time.

Results

At Weeks 21 and 28 of the course, participants responded to a prompt asking them to provide examples of times they felt their instructor supported their SB. Women's responses tended to align with themes from the literature on instructor care, describing ways their instructor demonstrated care such as showing a personal interest in students and being available to provide help (Bandura & Lyons, 2012; Garza, 2009). Table 1 shows the six different portrayals of instructor care that emerged from women's responses along with the frequencies of women who discussed each theme. Reported *n* counts refer to the number of distinct women who provided a response within each category at either Week 21 or 28, as the goal was to capture a landscape of ways in which women articulated their SB being impacted by their instructor rather than to explore changes over time. Corresponding percentages are based on the total number of distinct women who responded to the prompt at either Week 21 or 28 (*N*=40). Responses could be double-coded, so percentages do not add to 100%. In the sections that follow, I provide several examples of each theme, highlighting the various ways in which the instructors supported women's SB. The sections that follow are presented in order from most prevalent to least prevalent theme, as in Table 1.

Table 1. Type of Perceived Instructor Care that Emerged from Women's Descriptions of How Their Instructor Supported Their Sense of Belonging

Portrayal of Care	Example response	Frequency, <i>n</i> (%)
Involved students and checked for comprehension (Bandura & Lyons, 2012)	"My instructor has approached me during group work to make sure I am on track with the material."	19 (48%)
Provided help during a teaching episode (Garza, 2009)	"[The instructor] has come to our table several times to make sure we understand the problems and explains it when we do not."	19 (48%)
Established a safe and encouraging environment (Bandura & Lyons, 2012)	"[The instructor] doesn't make us feel bad about getting something wrong and treats everyone the same."	14 (35%)
Showed a personal interest in the students' well-being (Garza, 2009)	"[My instructor] wants to get to know all of her students. She has spoken to me not only on math, but also empathized with me when I said that I miss home."	14 (35%)
Was available to students (Bandura & Lyons, 2012; Garza, 2009)	"[The instructor] is always available to answer questions."	8 (20%)

Reflected a kind disposition through actions (Garza, 2009)	“Our instructor is always kind and welcoming. She is also very approachable and never yells at students.”	8 (20%)
--	---	---------

Involved Students and Checked for Comprehension

When describing the impact of their instructor on their SB, many women described the ways that the instructor involved students in the lesson. For example, one woman stated, “[My instructor] encourages everybody to participate and share their ideas.” Another woman noted, “[The instructor] usually engages with the class as he lectures, which keeps us more attentive and feeling valued.” More specifically, other women reported their instructors encouraging them to interact with their classmates during group work. One woman said, “Our math instructor encourages us to work with each other regularly. She encourages us to talk.” Another reported, “I think the group work she has us do does a lot for my social interactions with my classmates and I also think she tries her best to make sure everyone is engaged in class.”

Women also identified ways in which their instructor would check to see if they were understanding the material. For example, one woman reported, “[My instructor] asks us questions constantly,” referring to interactive lecture, and another stated that her instructor “checked our work and made sure we understood what was going on.” Some women described this in the context of group work – as students worked on problems together, the instructor would circulate and check in at the different tables to see how students were doing. As one woman noted, “[My instructor] approaches me during group work to make sure I am on track with the material.” Another woman reported, “[My instructor] is great at getting to every table and speaking with students while we’re doing group work.” These checks for comprehension made participants feel like the instructor cared whether they understood the material or not.

Provided Help During a Teaching Episode

In many cases, those checks for understanding led to another common theme. Many women described their instructor’s efforts during class to help them learn as supportive of their SB. Women reported that when they had questions about the material, their instructor provided clear and thorough explanations to help them understand. For example, one woman said, “One time, I was struggling to solve a problem in class and I asked my instructor to help me. He made me understand the concept the second time around and told me he would help me understand the concept as many times as needed.” Another woman echoed this idea: “[My instructor] makes sure we feel the content in our hearts and does not just throw content at us... She explains it very thoroughly and makes sure that you understand it.”

Some women ($n=5$, 13%) reported on receiving help during group work specifically. One woman described the instructor providing help after checking for comprehension: “During group work, the instructor goes around and makes sure everyone is on the right track, and if not, they go and help them.” Further, another woman said:

[My instructor] always walks around to talk with us during group work and doesn’t give us a hard time if he sees something wrong. He sticks there and works with the student even if it means giving a little extra group time.

This one-on-one attention during group work is something that made participants feel supported.

Establishing a Safe and Encouraging Environment

Some women explained that the safe and encouraging environment the instructor established contributed to their SB. In their descriptions, some reported feeling comfortable and not feeling

stupid or judged. For example, one woman shared, “She explains and teaches things in a way that makes me feel more comfortable being in the class.” Other times, they mentioned that their instructor reassured them when they were incorrect. One woman said, “She doesn’t make us feel bad about getting something wrong.” Another noted, “He explained why I did poorly without making me feel like an idiot.” The instructors made them feel safe to make mistakes and kept them from feeling stupid or inadequate.

One of the ways instructors can establish a safe and encouraging environment is by continually providing words of encouragement (e.g., Banduras & Lyons, 2009). In describing what their instructor did to support their SB, several women commented on the encouragement they received from their instructor. Participants reported their instructors communicating that they believed in students’ potential and ability to succeed in the course. For example, one woman explained, “[My instructor] encourages us and sees our potential even if we don’t see it ourselves.” Another reported, “[My instructor] assured us on the first day of class that he believes anyone can learn this material and we can all pass the class.”

Showed a Personal Interest in Students’ Well-being

Some women reported that their instructor supported their SB by showing a personal interest in them and getting to know their students as people. For example, one woman stated, “[My instructor] wants to get to know all of her students. She has spoken to me not only about math, but also empathized with me when I said that I miss home.” Another woman reported, “[The instructor] remembers who I am and details about myself so I feel like I am seen despite being in a larger sized class.” Others reported times that the instructor would relate to them by sharing their experiences as students. One woman said that her instructor “related his experiences back to ours and explained that even he had struggles with the material that we do,” which helped her feel included. Another woman reported that her instructor was “understanding of what we are going through in and out of class.” Relating to students and forming personal connections with them, despite the larger class size, made these women feel like they belonged.

Was Available to Students Outside of Class

Some women explained that their instructor supported their SB by being accessible and available to students. These responses were similar to those coded as *provided help during a teaching episode* but specifically mentioned the instructor as “always there” for them or described the instructors’ availability outside of class. For example, one woman reported, “[My instructor] is always available to answer questions and will spend lots of time making sure you understand.” Another woman noted, “My instructor is very supportive whenever I contact him. He provides me with any answers to any specific questions that I have.” Other women stated that their instructor was “open to helping outside of class,” and “there if we do have questions.”

Reflected a Kind Disposition

Finally, some women reported that their instructors supported their SB by being kind, approachable, or positive. For example, one woman reported, “[My instructor] is super approachable and cares about students.” Some women described the instructor as kind in conjunction with some other way they showed care. One woman said, “[My instructor] is a positive person and really pushes for everyone to get an A or B in the class. This shows she really cares about her students’ well-being and learning.” Here she both describes the instructor as positive and reports that the instructor encourages students that they can succeed in the course, which is part of *establishing a safe and encouraging environment*. Another woman reported,

“[My instructor] is a sweet human who just genuinely wants you to understand the content and makes sure you understand it.” This woman describes the instructor’s kindness in conjunction with the way they *provide help* and make sure students understand the material.

In summary, when asked to provide examples of what their instructor has done to support their SB, women tended to describe different ways that their instructor showed care. Considering Straits’s (2007) learning-centered versus learner-centered care, participants seemed more likely to discuss ways their instructor portrayed learning-centered care such as getting them involved in the lesson and providing help during a teaching episode or group work. Being encouraged to speak with their classmates and share their ideas, while also knowing they could go to their instructor for help made them feel like their instructor was on their side. Some women provided context in which the instructor showed care, which sometimes occurred during more interactive learning opportunities like group work and interactive lecture. Further, on occasion, participants seemed to view active learning opportunities and instructor care as overlapping rather than the context in which instructor care can be conveyed. For example, women reported that their instructor supported their SB by involving them in the lesson, which is the very essence of active learning. Women’s responses not only highlight benefits of employing active learning opportunities, but they provide details into how these opportunities can be enacted in a way that makes students feel cared for and like they belong in the class.

Discussion

Prior work has claimed that students can have varying experiences with active learning. On one hand, some scholars have found that women who engage in active learning report a higher SB (Griffin, 2021) and feel more cared for by their instructor (Rainey et al., 2019) than students who do not engage in active learning. On the other hand, other scholars have found that active learning classrooms can have unintended negative impacts on student experiences depending on its enactment (Deslauriers et al., 2019; Johnson et al., 2020). With this report, I aimed to explore ways in which instructors can support women’s SB outside of the learning opportunities they provide. Women’s descriptions of the ways in which their instructor supported their SB aligned with actions other scholars have identified as ways that students perceive instructor care.

Interestingly, some of these ways of showing care suggest specific actions instructors can take in facilitating active learning opportunities. For example, giving students time to work on problems in groups or individually might support their SB because this is one way to involve students in the lesson. As students work, the instructor can circulate the room to monitor students’ comprehension, make themselves available to students with questions, and provide help when needed. Interactive lecture or whole-class discussion is another context in which instructors can involve students, check for comprehension, and provide help. In the context of any pedagogical practice, even traditional lecture, instructors can establish a safe and encouraging environment by providing words of encouragement and reassuring students that making mistakes is part of learning. While prior research has linked SB with instructor care and instructional approaches (Rainey et al., 2019), the current study contributes concrete actions Calculus instructors can take in the enactment of their instruction such as responding to wrong answers with encouragement rather than judgment and sharing belief in students’ potential.

Future work should explore potential gender differences in portraying care via instruction. The current study included two instructors, one man and one woman, but all descriptions of ways they supported women’s SB were pooled. While both instructors were mentioned within each code category, it would be interesting to see if any portrayal of care was more or less prevalent across instructors, especially in terms of learner-centered or learning-centered types of care.

Acknowledgments

This work was made possible by the University of Delaware Graduate College's Dissertation Fellowship for Excellence.

References

- Aji, C. A. and Khan, M. J. (2019) The Impact of Active Learning on Students' Academic Performance. *Open Journal of Social Sciences*, 7, 204-211.
<https://doi.org/10.4236/jss.2019.73017>
- Bandura, R. P., Lyons, P. (2012). Instructor care and consideration toward students – What accounting students report: A research note. *Accounting Education*, 21(5), 515-527.
<https://doi.org/10.1080/09639284.2001.602511>
- Bressoud, D. M. (2023). Trends in math degrees. Retrieved from Launchings website:
<https://www.mathvalues.org/masterblog/trends-in-math-degrees>
- Chen, X. (2013). STEM attrition: College students' paths into and out of STEM fields (NCES 2014-001). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education.
- Cheng, D. X. (2004). Students' sense of campus community: What it means, and what to do about it. *NASPA Journal*, 41(2), 216--234. <https://doi.org/10.2202/1949-6605.1331>
- Chickering, A. W., & Gamson, Z. F. (1991). Seven principles for good practice in undergraduate education. *New Directions for Teaching and Learning*, 47, 63-71.
- Deslauriers, L., McCarty, L. S., Miller, K., Callaghan, K., & Kestin, G. (2019). Measuring actual learning versus feeling of learning in response to being actively engaged in the classroom. *Proceedings of the National Academy of Sciences of the United States of America*. 116(39). 19251-19257. <https://doi.org/10.1073/pnas.1821936116>
- Du Bois, B. (1983). Passionate scholarship: Notes on values, knowing, and method in feminist social science. In Bowles, G., & Klein, R. D. (Eds.). *Theories of Women's Studies*. London: Routledge and Kegan Paul.
- Eagan, K., Stolzenberg, E. B., Bates, A. K., Aragon, M. C., Suchard, M. R., & Rios-Aguilar, C. (2016). *The American freshman: National norms fall 2015*. Los Angeles: Higher Education Research Institute, UCLA.
- Eisenberg, N. (1992). *The caring child*. Cambridge, MA: Harvard University Press.
- Ellis, J., Fosdick, B. K., & Rasmussen, C. (2016). Women 1.5 times more likely to leave stem pipeline after calculus compared to men: Lack of mathematical confidence a potential culprit. *PLoS ONE*, 11(7), 1–14. <https://doi.org/10.1371/journal.pone.0157447>
- Evans, I. M., Harvey, S. T., Buckley, L., & Yan, E. (2009). Differentiating classroom climate concepts: Academic, management, and emotional environments. *Kōtuitui: New Zealand Journal of Social Sciences Online*, 4(2), 131-146.
<https://doi.org/10.1080/1177083X.2009.9522449>
- Ferreira, M. M., & Bosworth, K. (2000). Context as a critical factor in young adolescents' concepts of caring. *Journal of Research in Childhood Education*, 15(1), 117-128.
<https://doi.org/10.1080/02568540009594780>
- Fraser, B. J. (1998). Classroom environment instruments: Development, validity and applications. *Learning Environments Research*, 1, 7–34.
<http://dx.doi.org/10.1023/A:1009932514731>
- Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Jordt, H., & Wenderoth, M. P. (2014). Active learning increases student performance in science,

- engineering, and mathematics. *Proceedings of the National Academy of Sciences of the United States of America*, 111(23), 8410–8415. <https://doi.org/10.1073/pnas.1319030111>
- Fuchs, S., & Sahmbi, G. (2024). Investigating the impact of active learning in large coordinated calculus courses. *International Journal of Research in Undergraduate Mathematics Education*, 11, 217–240. <https://doi.org/10.1007/s40753-024-00234-6>
- Garza, R. (2009). Latino and White high school students' perceptions of caring behaviours. *Urban Education*, 44(3), 297–321. <https://doi.org/10.1177/0042085908318714>
- Griffin, C. (2021). Calculus instruction and female sense of belonging. In Olanoff, D., Johnson, K., & Spitzer, S. M. (Eds.). (2021). *Proceedings of the forty-third annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (p. 1331–1335). Philadelphia, PA.
<http://www.pmena.org/pmenaproceedings/PMENA%2043%202021%20Proceedings.pdf>
- Griffin, C. R. (2023). Women's sense of belonging in undergraduate calculus and the influence of (inter)active learning opportunities. *Journal of Research in Science, Mathematics and Technology Education*, 6(2), 65-82. <https://doi.org/10.31756/jrsmte.622>
- Griffin, C., & Berk, D. (2023). What women want: Pedagogical approaches for promoting female students' sense of belonging in undergraduate calculus. In Rueda, E. & Lowe-Swift, C. (Eds.). *Creating Academic Belonging for Underrepresented Students: Models and Strategies for Faculty Success*. Routledge.
- Griffin, C. (2025). Direct and indirect influence of active learning on women's sense of belonging in calculus. In Cook, S., Katz, B., & Melhuish, K. (Eds.). (2025). *Proceedings of the 27th Annual Conference on Research in Undergraduate Mathematics Education*. Alexandria, VA. http://sigmaa.maa.org/rume/RUME27_Proceedings.pdf
- Good, C., Rattan, A., & Dweck, C. S. (2012). Why do women opt out? Sense of belonging and women's representation in mathematics. *Journal of Personality and Social Psychology*, 102(4), 700–717. <https://doi.org/10.1037/a0026659>
- Johnson, E., Andrews-Larson, C., Keene, K., Melhuish, K., Keller, R., & Fortune, N. (2020). Inquiry and gender inequity in the undergraduate mathematics classroom. *Journal for Research in Mathematics Education*, 51(4), 504–516. <https://doi.org/10.5951/jresmetheduc-2020-0043>
- Kitzinger, C., & Wilkinson, S. (1997). Validating women's experience? Dilemmas in feminist research. *Feminism and Psychology*, 7(4), 566-574.
<https://doi.org/10.1177/0959353597074012>
- Lahdenperä, J., & Nieminen, J. H. (2020). How does a mathematician fit in? A mixed-methods analysis of university students' sense of belonging in mathematics. *International Journal of Research in Undergraduate Mathematics Education*, 6(3), 475–494.
<https://doi.org/10.1007/s40753-020-00118-5>
- Lahdenperä, J., Postareff, L., & Rämö, J. (2019). Supporting quality of learning in university mathematics: A comparison of two instructional designs. *International Journal of Research in Undergraduate Mathematics Education*, 5(1), 75–96. <https://doi.org/10.1007/s40753-018-0080-y>
- McCroskey, J. C. (1992). *An introduction to communication in the classroom*. Edina, MN: Burgess International Group.
- Mesa, V., Burn, H., & White, N. J. (2015). Good teaching of Calculus I. In D. M. Bressoud, V. Mesa, & C. Rasmussen (Eds.), *Insights and recommendations from the MAA National Study of College Calculus*. (pp. 83-91). Washington, DC.

- Noddings, N. (1984). *Caring: A feminine approach to ethics and moral education*. Los Angeles: University of California Press.
- Noddings, N. (1992). *The challenge to care in schools*. New York: Teachers College Press.
- Noddings, N. (2005). *The challenge of care in schools: An alternative approach to education* (2nd ed.). New York: Teachers College Press.
- President's Council of Advisors on Science and Technology (PCAST). (2012). *Engage to excel: Producing one million additional college graduates with Degrees in Science, Technology, Engineering, and Mathematics*. Washington, DC: The White House.
- Rainey, K., Dancy, M., Mickelson, R., Stearns, E., & Moller, S. (2018). Race and gender differences in how sense of belonging influences decisions to major in STEM. *International Journal of STEM Education*, 5(10). <https://doi.org/10.1186/s40594-018-0115-6>
- Rainey, K., Dancy, M., Mickelson, R., Stearns, E., & Moller, S. (2019). A descriptive study of race and gender differences in how instructional style and perceived professor care influence decisions to major in STEM. *International Journal of STEM Education*, 6(1). <https://doi.org/10.1186/s40594-019-0159-2>
- Rasmussen, C., Apkarian, N., Hagman, J. E., Johnson, E., Larsen, S., & Bressoud, D. (2019). Characteristics of precalculus through calculus 2 programs: Insights from a national census survey. *Journal for Research in Mathematics Education*, 50(1), 98–111. <https://doi.org/10.5951/jresmetheduc.50.1.0098>
- Seymour, E., & Hunter, A.-B. (Eds.). (2019). *Talking about leaving revisited: Persistence, relocation, and loss in undergraduate STEM education*. Boulder, CO: Center for STEM Learning.
- Shapiro, C. A., & Sax, L. J. (2011). Major selection and persistence for women in STEM. *New Directions for Institutional Research*, 14(7), 5–18. <https://doi.org/10.1002/ir>
- Straits, W. (2007). "She's teaching me": Teaching with care in a large lecture course. *College Teaching*, 55(4), 170-175. <http://dx.doi.org/10.3200/CTCH.55.4.170-175>
- Theobald, E. J., Hill, M. J., Tran, E., Agrawal, S., Arroyo, E. N., Behling, S., Chambwe, N., Cintrón, D. L., Cooper, J. D., Dunster, G., Grummer, J. A., Hennessey, K., Hsiao, J., Iranon, N., Jones, L., 2nd, Jordt, H., Keller, M., Lacey, M. E., Littlefield, C. E., Lowe, A., ... Freeman, S. (2020). Active learning narrows achievement gaps for underrepresented students in undergraduate science, technology, engineering, and math. *Proceedings of the National Academy of Sciences of the United States of America*, 117(12), 6476–6483. <https://doi.org/10.1073/pnas.1916903117>