1 **Instructor strategies to alleviate student stress and anxiety in colleges and universities**

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Abstract

While student stress and anxiety are frequently cited as having negative effects on students' academic performance, the role that instructors can play in mitigating these issues is often underappreciated. We provide summaries of different evidence-based strategies that instructors can employ to address and ameliorate student stress and anxiety that range from changes in instructional strategies to specific classroom interventions. We begin by highlighting ways in which instructors can learn about and prepare to act on issues of stress and anxiety. We then discuss how to better connect with students and build an inclusive, equitable, and empowering classroom environment. When coupled with strategies to change student evaluation and assessment, these approaches can collectively reduce student stress and anxiety, as well as improve student performance. We conclude by discussing the roles that instructors can play in empowering students with skills that improve their time management, studying, and approach towards learning, with an eye towards ensuring their success across all their academic endeavors.

Introduction

Several recent measures have indicated increases in mental health challenges in U.S. college students (Beiter et al., 2015; Eisenberg, Hunt, & Speer, 2013; Lipson, Lattie, & Eisenberg, 2018). In particular, nation-wide surveys of undergraduate students have identified stress and anxiety as major impediments to academic performance (ACHA-NCHA, 2019). While research on student stress and anxiety often group the two together, it is important to note that the clinical definitions distinguish between them. For instance, the American Psychological Association defines stress as a physical and emotional response typically caused by an external factor, while the inability to cope with stress can lead to anxiety and a range of related disorders (APA, 2019, Bamber et al., 2019).

While stress and anxiety may differ, it is clear that both are major issues facing college students. In fact, over one third of all college students report experiencing stress that impacted their academic performance within the past academic year (ACHA-NCHA, 2019; Morey & Taylor, 2019), and students with high stress and anxiety are more at risk of attrition or leaving the STEM major (England, Brigati, & Schussler, 2017; Muller et al., 2017). The prevalence of these mental health challenges is a complex issue that requires engaging stakeholders from across an institution, and there are undoubtedly many factors that can contribute to student anxiety and stress beyond academics. Here, we focus specifically on the role that instructors can play in supporting students and mitigating their stress and anxiety, providing a review of evidence-based practices that instructors can take to lower student stress and alleviate anxiety.

The role of higher education instructors in mitigating student stress, anxiety, and mental health challenges is underexplored (Di Placito-De Rango, 2018). Although there have been a number of studies, reviews, and books that examine factors that may contribute to student anxiety and stress, as well as potential interventions that may help reduce anxiety in students (von der Embse, Barterian, & Segool, 2013; Hattie, Biggs, & Purdie, 1996; Regehr, Glancy, & Pitts, 2013; Ribeiro et al., 2018; Yusuf, Nicoloso-SantaBarbara, Grey, Moyer, & Lobel, 2019) many of those works do not specifically focus on college students, or do not focus on the instructor. Instead, these reviews tend to emphasize broader programmatic steps that can be adopted by an institution that may not be directly applicable for an instructor. In contrast, our objective is to provide evidence-based strategies that can be implemented by new and experienced instructors in order to reduce their students' stress and anxiety and ultimately improve students' academic performance and quality of life. We provide these strategies in the context of our own experience as instructors in the life sciences; however, we expect that many of the approaches summarized here should be extensible to other academic disciplines. To organize our review, we focus these strategies into five main categories that span the arc of interacting with a student from the start to the end of a course and beyond:

- 1) Learning and Preparing to Act
- 2) Connecting with Students
- 3) Building an Empowering Classroom Environment
- 4) Reducing Testing Anxiety
- 5) Promoting Effective Academic Skills

In addition, we provide a summary of these strategies (Table 1) and a short list of recommended literature for instructors to read to learn more about these strategies (Box 1). In all of these strategies, we recognize that instructors may feel unqualified to address such issues, may be wary of worsening mental health concerns (White & LaBelle, 2019), and that instructors will differ in their comfort with addressing these issues. We emphasize that our advice here does not suggest that instructors take the role of mental health professionals; clear boundaries must be established when interacting with students regarding issues of mental health more generally. However, we hope that these evidence-based strategies can help instructors become informed and improve their ability to act proactively and respond to such issues.

Learning and Preparing to Act

In this first category, we describe the steps that instructors can take to familiarize themselves with the many ways that stress and anxiety can manifest in students, as well as the campus resources for helping students in crisis.

Be aware of underlying mental health issues

Academic performance and the pressure to succeed (or conversely, the fear of failing) are known drivers of stress and anxiety in college students (Beiter et al., 2015; Koul, Roy, & Lerdpornkulrat, 2012). Both stress and anxiety have been closely associated with depression and other mental health challenges as well as physical illness in college students (Kumaraswamy, 2013; Mahmoud, Staten, Hall, & Lennie, 2012; Rawson, Bloomer, & Kendall, 1994). These mental health challenges can manifest in many different forms, including depression and thoughts or attempts at suicide (Garlow et al., 2008).

Although instructors cannot (and should not) serve as health professionals, instructors can learn about common mental health challenges relating to stress and anxiety. Instructors that familiarize themselves and are aware of mental health issues can better direct students to the proper resources and likewise will have greater insight into how to approach these conversations with students if and when they arise. Many universities offer seminars or short trainings led by the campus health resources that are explicitly intended for instructors. While there is no replacement for seeking professional help and some students may need more intensive mental health supports, these workshops provide instructors with basic training on how to provide support and identify students in need. Trainings can enable instructors to be more familiar with the range of potential mental health challenges students may be facing, guide instructors through how to hold conversations supporting students and referring them to mental health resources when needed, and provide a range of possible resources for instructors to be aware of. Trainings often include role playing practice sessions to allow instructors to be more comfortable in conversations where students approach an instructor and appear anxious, depressed, or suicidal. Trainings may also discuss the role of faculty as mandated reporters in connecting students in danger with additional resources. The more instructors become familiar with these underlying mental health issues, the better prepared they are to appropriately respond and refer students to the proper resources when faced with a student in need.

Know and promote campus resources

Instructors can familiarize themselves with various campus resources, such as where to refer students to if they need mental health assistance, as well as the campus public safety office and emergency medical services. Many universities also have an explicit protocol for contacting the office of student affairs (or equivalent) if an instructor is concerned about a student experiencing an emergency and/or needs more immediate mental health assistance. Having a list of phone numbers and addresses easily accessible can be helpful so that instructors can connect a student to the appropriate resources or contact such resources directly when appropriate if there is a student in need (e.g., if a student appears to be struggling, has abruptly changed their behavior, or has communicated major stressors like a death in the family with the instructor). Similarly, instructors should encourage students to use the resources available on campus. Oftentimes, students are not aware of the resources (including mental health professionals, academic tutoring, and disability services) available to them, and even if they are, may be hesitant to reach out due to a perceived stigma or other barrier (Eisenberg, Downs, Golberstein, & Zivin, 2009; Wu et al., 2017). By discussing these resources and encouraging students to use these support systems, instructors can ensure that more students experiencing stress, anxiety, or other mental health challenges are paired with the proper resources.

There is often a range of other campus resources available to students that can alleviate stress and anxiety stemming from academic pressures. Many universities offer courses or workshops on academic skills, study strategies, and time management; different variants of these programs have been shown to promote student performance and retention and lower stress (see section on effective academic skills below) (Kimbark, Peters, & Richardson, 2017; Macan, Shahani, Dipboye, & Phillips, 1990). Some universities also offer peer tutors that can assist with either course content or academic skills. Instructors can familiarize themselves with these resources, ensure that students in their classes are aware of these resources, and refer students to these support systems when needed.

Connecting with students

In this category, we discuss several strategies that instructors can use to promote connections with students. Establishing these connections increases instructor immediacy, the perception of relational closeness and connection between the student and the instructor (LeFebvre & Allen, 2014). This can make students more comfortable in class and more willing to engage with the instructor both inside and outside of class (Cooper, Haney, Krieg, & Brownell, 2017). Unsurprisingly, greater instructor immediacy has been shown to alleviate stress (Williams, 2010).

Use student names

One of the simplest steps that instructors can take to connect with students and lower anxiety is to learn and use their preferred names and pronouns. While learning names may be more challenging for instructors teaching large classes, there are several strategies that instructors can use to learn student names more effectively. For instance, many institutions offer photo rosters to help instructors recognize and learn student names. Similarly, an increasing number of institutions now allow students to record their name out loud, helping instructors pronounce names more easily. Cooper et al., (2017) found that using name tents – pieces of paper where

students write and display their preferred names – helped dramatically increase the perception that the instructor knew student names in a high-enrollment biology class, despite the instructor not actually knowing the names of all students who perceived that the instructor knew their names. Instructors can also ask students to write preferred pronouns on their name tents if the students are comfortable doing so. Students also reported that instructors learned their names through interactions during class and immediately before and after class, as well as during office hours and other conversations outside of the scheduled class time (Cooper et al., 2017). As instructors, we have found that arriving a few minutes prior to the start of class to allow for time to both set up, as well as to check in and greet students, allows us to more effectively connect with students and learn their names.

Empathize with students and provide opportunities for interpersonal connection

In addition to learning and using student names, instructors should work to empathize with students and provide opportunities for interpersonal connection, which promotes a positive class dynamic and can reduce stress and anxiety about the class. In addition to the informal conversations that occur in the few minutes before and after each class, sharing personal stories can also enliven the classroom and help counter student perceptions about the course, topic, and/or instructor. The use of “instructor talk” in class – defined as any instructor language that does not directly convey the course concepts – has been documented as a way to build the relationship between the instructor and student, establish classroom culture and increase instructor immediacy (Seidel, Reggi, Schinske, Burrus, & Tanner, 2015). We have also found that sharing certain personal experiences enables interpersonal connection and promotes a growth mindset (as discussed below). For instance, when faced with students who struggle on a quiz or exam, we often bring up an example of an undergraduate exam gone wrong from our own experiences as students. We then discuss how we changed our study habits and how we improved following that experience. Sharing these stories encourages students and lowers anxiety by showing that it is possible to recover from a poor test performance and allows students to connect with us.

Use humor

The use of appropriate humor in class can also lessen anxiety in the classroom (Cooper, Hendrix, et al., 2018; Wanzer & Frymier, 1999). While there are many categories of inappropriate humor (such as ones that marginalize or disparage groups of students) that can damage student-instructor relationships, the use of appropriate humor can be used to strengthen the student-instructor relationship and establish a more positive classroom climate (Bekelja Wanzer, Bainbridge Frymier, Wojtaszczyk, & Smith, 2006; Cooper, Downing, & Brownell, 2018). In addition to lowering anxiety by providing a mechanism to cope with stress, the use of humor can also increase student perceptions of learning as well as their motivation and willingness to engage in class (Banas, Dunbar, Rodriguez, & Liu, 2011; Neumann, Hood, & Neumann, 2009; Wanzer & Frymier, 1999). Embedding humor into exams and other assessments has also been shown to lead to lower stress and increased perception of exam performance by students (Berk, 1996, 2010).

Allow for private office hour conversations

Many students perceive office hours negatively, with students often citing apprehension about using office hours and viewing them as a last resort (Smith, Chen, Berndtson, Burson, & Griffin,

2017). Despite the stress and anxiety that can be created by office hours, research on best practices remains limited. Nevertheless, students may feel more comfortable if they are able to talk to instructors in a private setting without other students present, particularly if they wish to discuss a sensitive topic. Instructors can remind students of office hours in class, encourage students to attend, and structure office hours to allow for this type of conversation. For instance, while holding office hours in a conference room elicits greater student attendance and participation, meetings scheduled by appointment through an online calendar system can create the space for other interactions. This provides opportunities for students to engage both in a more public setting conducive for broader questions about course content as well as in more private settings that allow students to feel comfortable speaking about more personal subjects. We have found that students are more willing to share with us in a private office hour setting, though acknowledge that there are tradeoffs and logistical constraints to offering individual appointments. Instructors in large classes may not have the time to offer appointments, and likewise hosting individual office hours will limit the number of students that the instructor can talk to in the same amount of time as compared to hosting open office hours.

Building an empowering classroom environment

While connecting with students is important, it is equally critical to build a classroom environment that empowers each student to feel comfortable learning. There are several strategies that instructors can take to promote such a dynamic.

Shape active learning strategies to minimize anxiety

The benefits of active learning strategies have been well-documented, including increased learning for students, a decrease in the achievement gap for identities historically underrepresented in the sciences, and improved attitudes and perceptions toward science (Armbruster, Patel, Johnson, & Weiss, 2009; Freeman et al., 2014; Haak, HilleRisLambers, Pitre, & Freeman, 2011). However, recent research has indicated that many active learning techniques can also increase student anxiety or the perceptions of student anxiety (Cooper & Brownell, 2020; Cooper, Downing, et al., 2018; Downing, Cooper, Cala, Gin, & Brownell, 2020; England et al., 2017), and that students employ both adaptive and maladaptive strategies to cope with this anxiety (Brigati et al. 2020). Some techniques, such as cold-calling – asking a student to share a response with the class without the student volunteering – have been identified as producing particularly high anxiety in students (Cooper & Brownell, 2020; England et al., 2017). In addition, different demographics of students (e.g. underrepresented students and students who speak English as a second language) may feel disproportionate amounts of stress and anxiety in an active learning classroom (Cooper & Brownell, 2016; Freeman et al., 2014; Mak, 2011). Students with high anxiety may even learn less in an active learning classroom (M. Cohen et al., 2019). Even modifying common techniques, such as cold-calling, to reduce apprehension may still lead to increased student anxiety as compared to not using such techniques (Broeckelman-Post, Johnson, & Schwebach, 2016). Similarly, such active learning has the potential to disproportionately impact underrepresented students; for instance, Cooper & Brownell, (2016) find that students in biology classes who are lesbian, gay, bisexual, transgender, queer, intersexual, or asexual (LGBTQIA) report that in-class groupwork, particularly if they are not allowed to choose their own groups, can increase their stress and anxiety given that they are faced with the challenge of potentially working with students who are not accepting of their identities.

While the diversity of active learning techniques makes it challenging to generalize about active learning and classroom anxiety, there are a few active learning techniques that may be less stressful than others. For instance, Cooper, Downing, et al., (2018) found that some types of active learning strategies, such as clicker questions and group work, had the potential to help lower anxiety levels for some students. Ultimately, few studies to date have investigated the impact of active learning interventions on reducing anxiety. While none of these studies suggest that instructors move away from active learning techniques given their benefits to student learning and retention, instructors can take steps to minimize the stress and anxiety often associated with these techniques by explaining the rationale behind their pedagogical techniques, allowing students to form their own groups, and providing students the time to think individually and share with partners before being asked to share with the class (Cooper, Downing, et al., 2018; England et al., 2017). These steps can also lead to a greater trust of the instructor in an active learning class, which has been shown to lead to increased student performance (Cavanagh et al., 2018), and would likely promote a more comfortable classroom atmosphere. Our own experiences align, with several students expressing to us in past courses that while they were initially resistant to some of the active learning techniques we implemented in class, hearing the pedagogical justification and seeing the results made them more accepting of these techniques.

Allow students to choose their own groups

Allowing students to form their own groups during both in-class or out-of-class groupwork can lessen stress and anxiety, particularly among students who may not wish to disclose parts of their identities (Cooper & Brownell, 2016). There is a growing body of empirical studies examining student group work and its impact on learning and attitudes (Chang & Brickman, 2018; Hodges, 2018; Jensen & Lawson, 2011). These studies have found that student learning and perceptions of learning increase, and anxiety decreases, when students are familiar with and comfortable sharing with their groupmates (Downing et al., 2020; Theobald, Eddy, Grunspan, Wiggins, & Crowe, 2017). Student anxiety is often driven by the fear of negative evaluation and allowing students to choose their own group can lessen this fear of negative evaluation by their peers (Cooper & Brownell, 2020; Downing et al., 2020). In addition, students have reported more positive group experiences with increased structure in groupwork (Chang & Brickman, 2018; Theobald et al., 2017). Thus, in addition to allowing students to choose their own groups, instructors may be able to lower student stress by assigning roles for students in groups, providing clear expectations with specific goals and objectives, and structuring activities so that students bring different pieces of expertise to the main groupwork. Our own experience with groupwork affirms these observations; we have also observed that allowing groups to remain consistent for a longer period of time (e.g. an entire unit or a semester-long project) can allow for group norms and foster a sense of community in the classroom that also extends outside the classroom, with students forming social networks with their groups and also relying on their partners for studying.

Create an inclusive and equitable classroom

An inclusive and equitable setting for learning, one where all students feel comfortable learning, sharing their perspectives, and making mistakes will create an empowering atmosphere that can reduce anxiety (Cooper & Brownell, 2020; Downing et al., 2020). Such a setting may begin with instructors recognizing the diversity of identities in the classroom. For instance, Tanner & Allen,

(2007) review the importance of cultural competence in the undergraduate biology classroom, as well as some general strategies for instructors to promote connecting to students from different backgrounds. Similarly, several studies (Barnes & Brownell, 2017; Truong, Barnes, & Brownell, 2018) demonstrate that using strategies grounded in cultural competence can lead to greater acceptance of evolution in religious students by reducing students' perceived conflict between religion and evolution. By engaging in culturally competent teaching approaches, instructors may reduce student anxiety by creating a classroom where students no longer feel that their identities are being challenged. More generally, Tanner, (2013) highlights several different techniques that can be used to promote inclusivity. These include using a broad range of culturally diverse examples in class (e.g. Schinske et al. 2016), being explicit in promoting inclusivity for all students, and varying the use of active learning techniques to reach a broader range of students.

Since student anxiety is often driven by fear of negative evaluation, fostering a classroom atmosphere where students are comfortable with being wrong can decrease student anxiety and stress and promote a more inclusive classroom (Cooper & Brownell, 2020; Downing et al., 2020). Downing et al., (2020) find that student fear of negative evaluation may be reduced by allowing students to work in groups with other students that they know (see section above), providing a chance for students to talk to their classmate after being called upon (referred to as "warm calling"), and framing errors as part of the learning process. Positive error framing can reduce stress and lead to both improved metacognition and learning for the student (Downing et al., 2020; Steele-Johnson & Kalinoski, 2014).

There are also several strategies instructors can take to promote equity in the classroom and ensure that all students are equally engaged and have the same opportunities to learn and participate. For instance, Cooper, Downing, & Brownell (2018) suggest that instructors can promote equity by gathering ideas from groups before sharing them with the class, and thoughtfully amplifying the voices of those who may identify from a group underrepresented in science. Eddy, Brownell, Thummaphan, Lan, & Wenderoth, (2015) recommend using frequent pair or small group discussions that are structured to promote equity in participation.

Avoid microaggressions, reduce stereotype threat, and affirm values

In addition, instructors can be cognizant of their choice of language and avoid microaggressions that may either consciously or subconsciously lead to some students not feeling welcome or included (Harrison & Tanner, 2018). By directly or indirectly speaking negatively about student identities, microaggressions can make students feel unwelcome and thus elevate stress and anxiety. In contrast, the use of "microaffirmations" – any non-obvious verbal or nonverbal cues to demonstrate kindness – can counteract the impact of microaggressions and promote student persistence (Estrada et al., 2019). Instructors can similarly reduce stereotype threat, i.e. the "risk of confirming a negative stereotype," or an association/expectation of conforming to a preconceived notion about a certain group of individuals (Steele & Aronson, 1995). Stereotype threat has been shown to increase student anxiety (Bosson, Haymovitz, & Pinel, 2004; Osborne, 2007) and negatively impact student performance and achievement (Cadinu, Maass, Frigerio, Impagliazzo, & Latinotti, 2003; Osborne, 2001). Unsurprisingly, stereotype threat also poses a challenge to recruiting and retaining a diverse group of STEM students (Casad & Bryant, 2016). In addition to eliminating language that promotes stereotype threat, instructors can also perform

specific interventions to mitigate stereotype threat. Seidel et al., (2015) posit that some types of non-content instructor talk can help reduce stereotype threat. For instance, explicitly de-linking the often-perceived association between exams and intelligence can decrease the impact of stereotype threat (Croizet & Claire, 1998; Spencer, Steele, & Quinn, 1999). Similarly, Johns, Schmader, & Martens (2005) find that explicitly teaching about stereotype threat can help reduce the negative impacts of such stereotype threat; in their study, an intervention where the instructor explained the idea of stereotype threat to women prior to those women taking a math exam led to lower anxiety and higher performance.

In contrast to the negative impacts of stereotype threat, interventions that promote values affirmation – the process of positively reinforcing values important to students – can counter the effects of stereotype threat (Jordt et al., 2017). Values affirmation may also lower stress levels (Creswell et al., 2005), though some specific values affirmation interventions may not alleviate levels of anxiety (Czech, Katz, & Orsillo, 2011; Peters et al., 2017). Despite this, values affirmation has been found to increase performance and reduce achievement gaps (Cohen, Garcia, Apfel, & Master, 2006; Freeman et al., 2014; Miyake et al., 2010; Peters et al., 2017). Even simple interventions that ask students to describe their values and how they practice and demonstrate these values in everyday life can thus be beneficial for students (Jordt et al., 2017).

Reducing testing anxiety

Exams and tests can often be a source of stress and anxiety for students. In this section, we first describe structural changes that instructors can make to such assessments to lower stress and anxiety and then describe interventions that can be used to lower anxiety prior to or during such assessments.

Reduce or modify high stakes testing

High-stakes testing has been known to cause anxiety in students across a diversity of settings (Cizek & Burg, 2006; Kruger et al. 2008). In addition, there is evidence that women and underrepresented students may be disproportionately disadvantaged by such high-pressure exams (Ballen, Salehi, & Cotner, 2017). Test anxiety can also contribute to increased student perceptions of difficulty and lower academic performance (England, Brigati, Schussler, & Chen, 2019). As such, instructors can attempt to mitigate such anxiety by reducing or eliminating high stakes testing whenever possible. For example, instructors can add smaller stakes quizzes to reduce the proportional weight of exams as well as to create a means for formative assessment that informs both the instructor and learners. In addition, instructors can implement schemes to reward improvement over time (e.g. Bailey et al., 2017), or drop the lowest quiz or exam score. This approach lowers the potential impact of each individual assessment. Finally, instructors can explore alternate means of assessments beyond high stakes testing, such as problem sets, essays, and lab reports (Ballen et al., 2017). Beyond the potential to reduce stress, using a diversity of methods for assessments (and thus lowering the weight of exams) has been shown to reduce the achievement gap of females in biology on both exams and the course as a whole (Ballen et al., 2017).

In addition, multiple studies demonstrate that open-book exams, or exams where students can bring in a “cheat sheet” with notes, can lower student stress (Durning et al., 2016; Erbe, 2007; Gharib & Phillips, 2012). However, the impacts of modifying exams to allow notes on student

learning is unclear; while some studies report no impact on student learning or performance, other studies have found negative consequences on learning, retention, and student motivation (Durning et al., 2016; Moore & Jensen, 2007).

Perform classroom interventions

There are also several interventions that instructors can implement to help reduce student anxiety and/or increase student performance for an exam or the course. For instance, concept mapping has been found to lower student anxiety about the learning of biology, which was attributed to increased metacognition, as discussed elsewhere (Jegede, Alaiyemola, & Okebukola, 1990; Okebukola & Jegede, 1989). In addition, asking highly anxious students to write about their testing worries immediately prior to an exam has repeatedly been demonstrated to help counter the expected negative impact of this anxiety on their test performance (Frattaroli, Thomas, & Lyubomirsky, 2011; Park, Ramirez, & Beilock, 2014; Ramirez & Beilock, 2011). Similarly, several studies on stress reappraisal, the guiding of students to perceive stress and anxiety as beneficial given the possibility of increased focus and attention, have also been shown to both decrease anxiety and increase exam performance (Jamieson, Mendes, & Nock, 2013; Jamieson, Peters, Greenwood, & Altose, 2016). In sum, these interventions have been shown to increase student performance for all students, including both low- and high-anxiety students (Harris et al., 2019). Instructors can either implement these interventions, or let students know of the relevant research, if they struggle with testing anxiety. Similarly, instructors can use published interventions relating to these themes that have been successfully implemented in a variety of courses (Doherty & Wenderoth, 2017; Harris et al., 2019). Finally, there are also a number of more general interventions that instructors can promote to lower stress, such as providing access to dogs prior to an exam (Barker, Barker, McCain, & Schubert, 2016; Jarolmen & Patel, 2018; McDonald, McDonald, & Roberts, 2017; Schroder et al., 2017; Trammell, 2017), or encouraging students to attend mindfulness and meditation classes (Bamber & Kraenzle Schneider, 2016).

Promoting effective academic skills

The strategies that have been described thus far are implemented by an instructor to reduce student stress and anxiety. However, there are many academic skills and strategies that a student could use to lower stress and anxiety; these strategies can therefore be implemented directly by the student in any of their courses. In this concluding section, we describe strategies that instructors can use to empower their students with better time management and study skills, as well as promote students' own thinking about how they learn and their mindset towards the process of learning.

Instill effective study habits and time management skills

Ineffective study habits and time management have been found to correlate with anxiety and lower student performance, and thus there have been calls for instructors to facilitate development of these skills in order to lower anxiety (Bruch, 1981; Cizek & Burg, 2006; Macan et al., 1990; Nonis, Hudson, Logan, & Ford, 1998; Wittmaier, 1972). Students may not be aware of how to study effectively, and thus instructors can promote these study strategies by explicitly discussing them with their classes. These strategies include 1) explicitly discussing the use of learning objectives with students and modeling the writing of a question based on a learning objective (Osueke, Mekonnen, & Stanton, 2018), 2) suggesting that students re-take past quizzes, exams, and assessments and reflect upon their performance (Walck-Shannon, Cahill, McDaniel,

& Frey, 2019), 3) teaching students how to self-evaluate their own work (Osterhage, Usher, Douin, & Bailey, 2019), 4) guiding students towards self-regulated learning where they set goals and monitor progress toward those goals (Sebesta & Bray Speth, 2017), 5) encouraging group studying where students can clarify concepts with peers (Kritzinger, Lemmens, & Potgieter, 2018), and 6) promoting regular and spaced out study time in preparation for tests (Roediger III & Karpicke, 2006).

Similarly, targeted programs to promote time management in college students have lowered their stress and anxiety (Aeon & Aguinis, 2017; Häfner, Oberst, & Stock, 2014; Häfner, Stock, Pinneker, & Ströhle, 2014). The core elements of these interventions include prioritizing, goal setting, strategy development, daily planning, and monitoring and reward structures as achieved by a series of self-reflection questions followed by a planning exercise (Häfner & Stock, 2010). Such interventions may be particularly useful for reducing procrastinating and time discounting on larger or more long-term activities (Koch & Kleinmann, 2002). We regularly implement brief self-reflection exercises in the classroom, often focused on daily planning that includes the explicit incorporation of rewards that are also expected to reduce stress and anxiety (e.g., going to the gym to exercise after finishing an assignment).

Use metacognition

Multiple studies have indicated that promoting metacognition, where a student thinks and reflects about their own learning, can lead to reductions in test and course anxiety (Alaiyemola, Jegede, & Okebukola, 1990; Everson, Smoldaka, & Tobias, 1994; Matthews, Hillyard, & Campbell, 1999; Spada, Nikcevic, Moneta, & Ireson, 2006). Students generally need to be prompted to deliberately engage in metacognition. For instance, instructors can implement exam-wrappers, a questionnaire usually provided to students after an exam that asks them to reflect on their studying, preparation, and performance on the exam (Pate, Lafitte, Ramachandran, & Caldwell, 2019). The use of exam-wrappers may lead to increased knowledge of cognition and higher performance (Edlund, 2020; Gezer-Templeton, Mayhew, Korte, & Schmidt, 2017; LaCaille, LaCaille, & Maslowski, 2019; Langdon et al., 2019). Similarly, instructors can implement such metacognitive questions into homework or problem sets, or ask students questions that promote metacognition during individual or class meetings. For instance, as instructors, we regularly prompt students to use notecards to reflect on what they did well in the past week and what they wish to improve on in the coming week as a simple method for promoting metacognition.

Promote a growth mindset

Language that promotes a growth mindset, or the belief that skills, personality, and intelligence can change and be improved, has been linked to greater academic achievement and improved grades (Claro, Paunesku, & Dweck, 2016; Yeager et al., 2019). This contrasts with a fixed mindset, whereby students believe that their intellectual abilities are immutable (Dweck 2000, Claro, Paunesku, & Dweck, 2016). Likewise, fostering a growth mindset has been shown to mitigate stress and anxiety in psychological studies (J. L. Schleider & Weisz, 2016; J. Schleider & Weisz, 2018; Schroder et al., 2017). While the literature examining a growth mindset and the impact on stress in the classroom is sparse, instructors can have a direct influence on students' perceptions of a growth mindset (Powers, 2015). Instructors can incorporate short messages promoting a growth mindset in the classroom and encourage further growth and improvement in

students. For example, we often praise students on improvement and encourage students who struggle to come talk to us, reflect on their learning, and then improve on the next assessment. In addition, course policies that reward increased learning may also promote a growth mindset, reducing anxiety while fostering and maintaining student motivation. For example, Fernandez (2020) describes promoting a growth mindset by structuring grading around mastery, while providing students a second chance at answering questions on an exam.

Conclusion

We have presented multiple evidence-based strategies that instructors can employ to reduce student stress and anxiety. These strategies span a range of approaches, from modifying instructional techniques to empowering students with different mindsets and tools that they can use to alleviate stress. In combination with promoting aspects of a healthy lifestyle (e.g., sufficient sleep, getting exercise, and identifying a supportive community of friends), we hope that instructors can not only reduce stress and anxiety in their students, but also empower their students with tools, techniques, and a mindset that can help them across all their academic endeavors.

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Table 1. A summary of the strategies that can be employed by instructors to reduce student stress and anxiety.

Category	Strategy	Summary of strategy
Learning and Preparing to Act	Be aware of underlying mental health issues	Familiarize themselves with underlying mental health challenges, and know how and when to refer students to campus resources if needed
	Know and promote campus resources	
Connecting with Students	Use student names	Take steps to learn student names, such as using name tents, and connect with students to increase instructor immediacy
	Empathize with students and provide opportunities for interpersonal connection	
	Use humor	Use appropriate humor to promote a positive classroom atmosphere
	Allow for private office hour conversations	Enable greater student comfort with asking questions and having a conversation
Building an Empowering Classroom Environment	Shape active learning strategies to minimize anxiety	Be aware of some active learning strategies (e.g. cold-calling) that can increase stress and take steps to decrease anxiety when using active learning techniques, such as allowing students to form their own groups
	Allow students to choose their own groups	
	Create an inclusive and equitable classroom	Use cultural competence and be explicit about promoting a classroom environment where all students are included and treated equally; be aware of and avoid microaggressions or language that introduces a stereotype threat
	Avoid microaggressions, reduce stereotype threat, and affirm values	
Reducing Testing Anxiety	Reduce or modify high stakes testing	Build in alternate means of assessment to reduce high stakes tests that lead to high anxiety, or modify the structure of exams to lower stress
	Perform classroom interventions	Use specific interventions, like having students write about their anxiety, in order to reduce their stress and improve their performance
	Instill effective study habits and time management skills	Promote strong learning strategies and a growth mindset where students know they can improve
	Use metacognition	
	Promote a growth mindset	

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Box 1. An annotated list of additional reading.

- **Cooper and Brownell (2020):** In this book chapter, Cooper and Brownell⁵²⁸ summarize the literature on how active learning impacts stress in the college⁵²⁹ science classroom, and provide more information on how to best employ active learning techniques while minimizing stress.
- **Tanner (2013):** In this synthesis paper, Tanner provides a summary of strategies instructors can take to improve engagement and equity in the classroom, which correlate with lowering stress and anxiety.
- **Hodges (2018):** In this article, Hodges discusses different types of group work in the classroom, group formation, how students learn in groups, and why some groups fail. This article provides insight into how instructors can most effectively manage group work, thus lowering stress.
- **Regehr et al. (2013):** In this article, Regehr et al. provide a review and meta-analysis of interventions to lower stress in college students. While most of the interventions are broader campus-level interventions that are not realistically implemented in a classroom by an instructor, the article provides great insight into what techniques are most effective at lowering stress in college students.

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