

Stress and Mental Health in Graduate School: How Student **Empowerment Creates Lasting Change**

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Supporting Information

ABSTRACT: This article describes an ongoing initiative of the Department of Chemistry (Chem. Dept.) at the University of Minnesota (UMN) to support the mental health of graduate students. With the increasing pressure on students to carry out novel research, publish articles, learn a broad range of skills, and look for career opportunities, the levels of stress, anxiety, and depression among graduate students are on the rise. For tackling these issues, the UMN Chem. Dept. has adopted an approach that heavily relies on the involvement of graduate students and student empowerment. This contribution describes the results of a collaboration between a student group (Community of Chemistry Graduate Students, CCGS), the director of graduate studies of the Chem. Dept., and mental health professionals at the UMN campus health service, to



provide strategies for ensuring a welcoming and productive departmental climate. It describes the events that CCGS has hosted to help to improve the mental health of students, and raise awareness and stimulate open discussions about this topic. As an early intervention strategy, the UMN Chem. Dept. revised several policies to ensure that students receive frequent feedback from their advisors. Through the collaboration of the CCGS, UMN Chem. Dept., and UMN campus health service, a survey for the evaluation of mental health and stress factors in graduate studies was developed. Findings of the survey attest to the stigma associated with mental health, as more than 40% of the graduate students responded that they did not consider consulting with a therapist, counselor, or physician even when they felt that their health was affected by the level of stress in their lives. The results also show the importance of an open and friendly environment for students who struggle with stress and mental health, as they were most likely to approach a friend rather than advisor, counselor, or physician.

KEYWORDS: Graduate Education/Research, Collaborative/Cooperative Learning, Student/Career Counseling, Student-Centered Learning, Curriculum

INTRODUCTION

A large number of academics are affected by mental health issues such as anxiety and depression; $^{1-4}$ yet, the topic of stress and mental health in higher education is often considered taboo and is rarely discussed publicly. Facing uncertain career prospects, graduate students in particular experience high levels of stress and are vulnerable to developing mental health disorders.⁵⁻⁹ A survey of 790 graduate students from all disciplines at the University of California at Berkeley (UCB) found that almost 47% of Ph.D. students could be clinically classified as depressed.¹⁰ Another study at UCB found that 9.9% of the graduate and professional students had contemplated suicide over the preceding 12 months; similar results were noted at the University of California, Irvine.¹¹ Sadly, there have been several cases of graduate students suicides.^{12,13}

Graduate students must learn a broad range of knowledge and skills, advance in their research projects, meet deadlines, become independent problem solvers, and develop career opportunities before graduating. There is constant pressure to perform well, and learning to cope with moderate levels of stress is a key factor for graduate student success. Excessive levels of poorly managed stress, especially over extended periods of time, harm physical and mental wellness. While initiatives exist that advocate to improve mental health and stress management on many campuses,^{14,15} the majority of those activities focus on undergraduate students; few recognize and address the needs of graduate students.

Surveys of graduate students by organizations such as the Graduate Assembly at UCB and the American Chemical Society have aimed to understand the parameters that contribute to students' well-being, happiness, and successful

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career development.^{10,16} Although such efforts have raised awareness of needs and concerns specific to graduate students and have offered a number of recommendations, it is poorly known to what extent recommendations have been adapted locally or if changes in the graduate programs were achieved. Moreover, the variability in study parameters, such as in the time of data collection, field of study, demographics, and geographical origin of the survey takers, affects the survey results and their relevance to the needs and priorities of other programs. It remains unclear what strategies graduate programs can employ to effectively improve the culture of mental health and well-being among graduate students.

This article describes an ongoing initiative of the Department of Chemistry (Chem. Dept.) at the University of Minnesota (UMN) to support mental health in graduate studies. As a part of this initiative, our graduate students, faculty, and health professionals developed a recurring survey that assesses stress levels and the mental health of the chemistry graduate student body. Herein, we present a review of our mental health initiative and the highlights of the program evaluation.

RESULTS AND DISCUSSION

Initiative Overview

The UMN Department of Chemistry is one of the largest in the US, with approximately 240 graduate students, 40 faculty members, and over 16,000 undergraduate student enrollments per year. Eight research centers are run by its faculty members. The research program is well funded, and over a dozen faculty serve as chief or associate editors of major chemistry journals. Graduate student recruiting focuses exclusively on Ph.D. students. Roughly one-third of the graduate students are female; one-third are international.

The Chem. Dept. mental health improvement initiative originated in 2012 and is a collaboration of three parties.

- (1) A group of graduate students advocating for student mental health for students within the program (the "Community of Chemistry Graduate Students", CCGS).
- (2) The department's director of graduate studies (DGS) with department leadership support.
- (3) Health professionals and mental health experts from the UMN campus health service (Boynton Health).

Figure 1 illustrates the working relationship of the three parties. A project can be initiated by any one of the three. Although each group has its own individual responsibilities, the



Figure 1. Schematic depicting the parties involved and tools available for a collaborative effort directed to improve the mental health of a graduate student population.

groups closely collaborate to cause changes in the graduate program. This arrangement expands the number of tools available for addressing the mental health of graduate students beyond those that would be available to any one group. The diversity of professional and educational perspectives contributes to a better understanding of mental health factors specific to the UMN Department of Chemistry. The contributory roles and interplay of these efforts to the mental health improvement project are illustrated in Figure 2.



Figure 2. Chart showing the interplay of efforts and contributory roles of the mental health improvement project.

Initiative Origins

Graduate student stress and mental health issues were historically addressed within the UMN Chem. Dept. on an individual level by a limited number of motivated staff and faculty members who had accumulated skills in dealing with mental health situations. However, open departmental discussion and coordinated efforts to systematically tackle the issue of mental health in graduate studies were missing. This changed in 2012 when the director of graduate studies chose to prioritize efforts to address stress and mental health in the graduate program. Key goals were to make graduate students both happier and more productive, to reduce factors contributing to unnecessary stress, and to better prepare the department for emergencies. Involvement of graduate students in these efforts was considered crucial as were mental health and evaluative expertise from outside the department.

The collaboration between the UMN Chem. Dept. and the campus health service, Boynton Health, was inspired by a teaching enrichment event that included a presentation on stress and mental health organized by Boynton Health. Recognizing the importance of this topic, the chemistry DGS



Figure 3. Examples of survey questions and results on help-seeking behavior of chemistry graduate students at UMN, Chem. Dept.



Figure 4. Examples of 2013 and 2016 survey questions and results about relationship with peers, and progress toward degree of chemistry graduate students at UMN.

invited Boynton Health to present at a special event for the department. While the overall attendance of faculty members was low, the attendance of over 60 graduate students and staff members was a surprise to many. This recognition of the importance of graduate student mental health by the department provided an opportunity for further dialogue and inspired a group of graduate students to establish a graduate student group with a specific focus on mental health, the Community of Chemistry Graduate Students, CCGS.

The CCGS has become one of the best recognized graduate student groups on campus. The CCGS works with the DGS and other members of the department to host recurring events and workshops. CCGS events and activities focus on three areas of social, physical, and mental health and are designed with one or more of the following goals:

- (1) To increase awareness of mental health in graduate studies, to acknowledge that issues such as stress, anxiety, and depression are more common in graduate programs than often realized, and to emphasize that individuals can recover from these issues by seeking help and treatment
- (2) To ensure that graduate students are aware of resources and facilities available to them on campus (such as counseling services and therapy sessions, disability resources, and the conflict resolution center)

Article

- (3) To promote the skills that empower graduate students to constructively deal with challenges of graduate studies such as stress and high workloads (by hosting presentations delivered by experts)
- (4) To address social isolation and potential loneliness of students by hosting social events where students can interact with individuals and faculty members outside of their research groups in a friendly and informal environment

Examples of initial events held by CCGS include departmental yoga classes, movie nights, workshops on healthy eating and the negative effects of sleep deprivation on mental health, and information sessions by the UMN Recreation and Wellness center and the UMN Center for Spirituality and Healing. Although events were consistent with CCGS goals, members began to question whether they could improve their impact. They concluded that, for them to be effective, they required an assessment of the current state of stress and mental health concerns of graduate students, identifying the factors that graduate students perceive as causing stress. To accomplish this, they turned to Boynton Health.

Mental Health Survey

Boynton Health (BH) has administered a Student Health Survey (SHS) of the campus every 2–3 years since 1995.¹⁷ The SHS is broad in scope and inclusive of both undergraduate and graduate students. The survey inquires about healthrelated status and behaviors, including general health status; health care access; insurance status; exercise patterns; consumption of alcohol, tobacco, and drugs; sexual behavior; stress; mental health diagnoses; and other health factors. Although the survey provides extensive detail on the health of the student body, practical concerns such as the survey length limit the amount of detail that can be collected on any specific health topic.

BH was intrigued by the chemistry department's invitation to look at the mental health concerns of graduate students in more depth, particularly in the context of a specific department. Neither BH nor the CCGS were aware of any previously conducted mental health survey of an individual graduate program. Over the course of a year, CCGS members, the chemistry DGS, and representatives from BH met regularly to formulate survey questions specific to the needs of the department's graduate students. Content included questions on the following areas: demographics; funding situation; progress toward degree; work hours; physical health (sleep patterns, use of alcohol and recreational drugs, exercising habits), mental health (social isolation and depression symptoms); relationship with the academic advisor, group members, and other members of the UMN Chem. Dept.; stress and anxiety in relation to different factors; and help-seeking behaviors when facing mental health issues. BH directly managed the survey, collected responses, and managed the release of the compiled data to the Chem. Dept. This ensured confidentiality of the survey takers and prevented the identification of any graduate student based on their responses. Figures 3 and 4 show the results of selected questions that were relevant to this article (details of methodology and data analysis listed in the Supporting Information).

The survey was first administered in November of 2013. Participation was actively promoted by CCGS, the department's chair and DGS, and BH; the participation rate of 49.2% (118/240) was much higher than expected. Over several months, CCGS, the DGS, and BH met frequently to discuss survey results, identify issues affecting mental health of graduate students, and propose possible strategies to address problems identified by the survey.

A presentation of the data, key findings, and suggested strategies was delivered to all the members of the Chem. Dept. in January 2014. Following the formal presentation, BH representatives facilitated an engaged discussion among students, staff, and faculty, which helped with the development of ideas on how to address some of the issues identified by the survey. Even though the event took place in the middle of winter and only 2 weeks before the start of the semester, attendance by students, staff, and faculty was high, clearly indicating substantial buy-in from across the whole department. Moreover, this event set a milestone for open departmental discussions targeted to improving the mental health of graduate students and fighting the stigma associated with this topic.

The chemistry graduate student survey has subsequently been administered in the UMN Chem. Dept. every other year as a benchmark to evaluate the progress of the stress and mental health initiative in the department. Results are used promptly to direct policies and departmental events. The survey is evaluated and revised following each administration with questions revised, dropped, or added, to cover past shortcomings. In this manner, the survey is a living document that evolves with the changing nature and needs of the whole department. The participation rate in the 2016 survey increased from 49.2% (2013) to 59.3%.

Survey results are instructive of how the department might tailor its approach to mental health. For example, graduate students were asked what individuals they would consider consulting "If you felt that your health was being affected by the stress in your life". Interestingly, 91% of survey takers responded that they would consider consulting with a friend, but only 48% considered consulting with their academic advisor (Figure 3). More than 50% of students responded yes when asked "Have you talked with anyone within the past 6 months about concerns you have about the level of stress in your life and its effect on your life?" This indicates that a large fraction of the student population suffers from high levels of stress. The survey has also demonstrated that students are less likely to seek out help from a professional such as a primary care doctor or counselor than from friends or family members. Only 26%, 7%, and 16% approached a counselor, primary care doctor, and their academic advisor, respectively. This realization attests to the stigma associated with discussing mental health related topics even with medical professionals.

These results highlight the importance of social support from friends and family, as they are the first to be sought for help and can play a key role in convincing an individual to pursue professional help. However, a friendly and welcoming environment in the graduate program and research group is also critical for maintaining the mental health of graduate students; having a trusted friend or person in the department to talk to in stressful situations is important. Since most graduate students have relocated to a different city or country to join their selected research program, the circle of their social support is often compromised. Moreover, students dedicate long hours to research in the laboratory, reviewing the literature, and studying for coursework, leaving limited available time to meet new friends and/or spend time with existing ones. Therefore, their primary social interactions are with group members and members of their department. Indeed, the importance of social support on decreasing the levels of anxiety and emotional exhaustion and increasing job satisfaction is recognized in the context of occupational health research.^{1,18–20}

The 2013 and 2016 surveys also included questions designed to evaluate the working environment and relationship between students (Figure 4). Graduate students evaluated the work environment as very positive, and most students either agreed or strongly agreed that they felt supported and valued by other graduate students; they felt comfortable making friends in the department and could easily approach other students with work-related concerns. A comparison of the 2013 and 2016 results suggested a slight improvement of the work environment in relation to the question "I feel comfortable approaching other chemistry students with work related concerns" ($X^2 = 35.945$, p < 0.0001). Although it is possible that this change reflects the influence of the mental health initiative, it is not possible to confirm this because many factors contribute to the work environment (such as changes in the composition of the student body over time) and because the data is not compared to that from a control group. However, the survey did reveal a slight decrease in the number of students who have considered or seriously considered leaving the program between 2013 and 2016 (Figure 4). Changes in related questions did not reach statistical significance. Despite this, the positive trend is encouraging and suggests that the mental health initiative activities are moving the Chem. Dept. in the right direction.

Understanding correlations between the success of graduate students and their work environment should be of interest to any graduate program, and we hope to learn more about this through future surveys. At this point, it is unclear how the UMN Chem. Dept. compares to other equivalent graduate programs in regard to these variables, since data is not available for other departments or graduate programs. Notably, BH has recently implemented the graduate student survey in eight other departments of the UMN to gain more information on the effect of the field of study on the mental health of graduate students.

Program Modifications

Effects of the initiative may take more time to be detected with statistical significance. However, the departmental presentations of survey results were effective in establishing a more open atmosphere in the department, in which it is now expected that stress and mental health are talked about candidly. Interesting examples of this are recent contributions to our department's so-called "safety moments". As part of its safety culture,²¹ every seminar in the UMN chemistry department starts with a very brief safety moment. A physical chemist might give a hint on how to avoid injury to eyes from lasers, and an organic chemist might share proper procedures to avoid liquid oxygen in cold traps. In reflection of the new departmental climate, faculty and students have recently devoted some safety moments to stress and mental health topics.

The collaborative effort exemplified by the survey has contributed to additional momentum in the work of the CCGS. For example, the CCGS recently modified most of its events to focus on providing greater opportunities for students to receive feedback and learn soft skills to better manage the ambiguity of the graduate studies experience. One example is "Surviving and Thriving in Graduate School" panel discussions, at which several faculty members, and occasionally representatives from local industries, are invited to provide advice on skills needed in graduate studies and professional careers, and to share personal experiences, challenges, and management skills in their own graduate careers. Surviving and Thriving events are held once every semester and allow students to learn from a diverse group of mentors. The importance of soft skills, emphasis on communication and project management, and prevention and early intervention when dealing with challenges and conflicts are guiding principles frequently repeated in these panel discussions. Evaluations of the events by graduate students have been highly positive.

The success of Surviving and Thriving panels inspired CCGS members to address these topics in a more systematic way by establishing a digital library of useful advice that is broadly accessible. Students filmed and edited short video clips in which chemistry faculty members explain their experiences and share suggestions on specific topics. These were then posted on YouTube under "Surviving and Thriving in Higher Education", making them accessible to everyone.²² Additional videos were prepared in collaboration with BH on depression in graduate students, covering the signs of depression as well as strategies for prevention and early intervention, and encouraging students to counsel with a therapist at BH when experiencing symptoms.²³ In one of the videos, a faculty member of the UMN Chem. Dept. details his struggles with depression during graduate studies and describes how he recognized the issue and sought professional help, ultimately recovering through medication, therapy, and support of friends and family. In another clip, the DGS comments on the frequency of depression in graduate students and emphasizes that many students who struggle with depression are very good students but may have set too high of an expectation of themselves. All videos are promoted openly to the whole department to fight the stigma associated with struggles with mental health.

It emerged from the analysis of the survey results and subsequent departmental discussions that graduate students found it difficult to assess their progress in the program. This was noted to be particularly true for students in the third and later years of graduate studies. These years follow the written and oral preliminary Ph.D. exams in the second year but precede the final Ph.D. defense, which typically falls at the end of the fifth or beginning of the sixth year. It was recognized that providing specific feedback to students during this time period had the potential to avoid mental health complications caused by stress, anxiety, and self-doubt and to improve the graduate student experience. To this end, a new milestone was introduced. Now, students meet in the fourth and later years of graduate studies with the prospective committee reviewers of their final Ph.D. thesis (typically individually) to discuss progress in research, career planning, and any other issues that may be of concern to the students. This ensures that the students discuss these important topics not only with their advisor but also with others to get more diverse feedback. Faculty learned to appreciate this milestone as additional help for students with a tendency to procrastinate.

An additional improvement in the graduate program was the introduction of a revised form for the annual evaluation of graduate student progress by graduate student advisors. CCGS was directly involved in the development of this new form. The form asks students to first complete a self-assessment of their

progress in areas such as research and experiment planning, literature proficiency, independent problem-solving skills, time management and organizational skills, record keeping and data archiving, presentation and writing skills, team interactions, career planning, and laboratory safety practices. The advisor then assesses the student's self-evaluation and meets with the student to discuss discrepancies. This self-assessment and review helps address excessive student self-criticism and provides an opportunity to recognize if a student has unrealistic expectations of themself and the progress of their work (which could be a source of frustration and stress). The meeting also provides an opportunity for the advisor to directly express concerns about the performance of the student in specific areas (which the student might be entirely oblivious to) and prompts an open discussion to identify strategies for improvements in those areas. Use of supportive communication (calmly identifying the issue and maintaining a welcoming and unbiased environment by reassurance through compliments, voice, and body language)¹⁵ would be crucial for an effective discussion. As of 2018, the form will also introduce two brief mental health questions, the answers to which the students may share with their advisor or submit anonymously. (The form is included in the Supporting Information.)

Additional CCGS events that have originated out of the mental health initiative are coffee hours, group runs, and summer picnics, which provide opportunities for more frequent social interactions and formation of friendships between students. This is particularly important for students in their third or later years of graduate studies, who in our program are typically no longer taking courses and whose social interactions during the work week are generally confined to those in their research group. The biweekly coffee hours allow students to socialize outside of a laboratory setting. They often feature a theme, such as Chinese New Year, Pride Week, Earth Day, and Meet the Chemistry Faculty, and are often hosted by students outside of CCGS; this allows for a broad range of themes and promotes a welcoming atmosphere to all members of the Department. By hosting events not only focused on mental health, CCGS has increased attendance throughout all events with a subsequent increase in awareness of mental health issues throughout the department. In addition, CCGS members prepared posters on how to access on-campus resources for professional help and counseling and displayed these posters in several locations in the Chemistry Department.

CCGS recently started coaching graduate student groups in several other UMN departments to implement mental health initiatives based on this model. These discussions revealed the importance of departments being open to talking about mental health and to engaging students in addressing related issues. It also became evident that the culture in the Chemistry Department was uniquely welcoming and supportive of student activities; such initiatives were not considered a waste of time or to be in opposition to department policies and authorities. Indeed, in addition to the Chem. Dept.'s encouragement of CCGS members, the department also allocated an annual budget to fund CCGS events. This support was crucial for the success of CCGS activities. Empowering graduate students with leadership roles has been a historical practice of the chemistry department. For example, the department's safety initiative is led by a group of graduate students and postdoctoral associates, referred to as "Joint Safety Team", JST, which collaborates closely with

chemistry department leadership, the campus's Department of Chemical Engineering and Materials Science and Department of Environmental Health and Safety, and the Dow Chemical Company to address the culture of safety in UMN chemistry laboratories.²¹ Other graduate student groups include the Graduate Student Workshop Committee, Science for All, and Chemistry Women in Science and Engineering. These student groups provide venues that allow students to develop leadership skills, experience a sense of belonging to the community, and design events and workshops that better suit their needs. Providing graduate students a central role in the mental health initiative has all of these advantages, and it also provides them with an opportunity to address concerns relevant to all graduate students

CONCLUSIONS

The issue of mental health among graduate students is an important and complicated topic. Although there is no universal solution or quick fix for addressing it, academic departments can make a difference. Lasting and effective change in the culture can be accomplished by team work. This requires a change in attitudes toward mental health within graduate programs and sustained collaborative efforts from all the parties involved. The latter include University Leadership (through policy and provision of counseling programs, facilities, and mental health professionals), the graduate programs administration, faculty, and the graduate students themselves. The Chem. Dept.'s Graduate program at the UMN has explored this path since 2012. We hope that, by sharing our experiences, we may inspire new ideas and initiatives in other programs. To this effect, we have highlighted below a number of guiding principles specific to the three roles in our model to assist other programs in replicating and/or adapting our effort.

Graduate students are advised to

- Take on leadership roles.
- Engage a diverse group of individuals to represent the needs of all students.
- Target a range of needs, get feedback about events and activities, and create a friendly environment at events.
- Be resourceful, work with department representatives (DGS, Chair, staff, faculty), and reach out to experts in the field. Engage everyone.
- Do not attempt to be a therapist for individuals struggling with mental health issues. Instead, ensure that they know how to access the University Mental Health Services, and encourage them to set up an appointment with a professional.

Graduate programs are recommended to

- Value student empowerment and recognize that students can be the driving force behind change and improvement. Do not hesitate to ask for help from students to offer relevant activities that there might not otherwise be sufficient resources for organizing.
- Support student initiatives by dedicating a budget to graduate student groups; meeting with the leadership of student initiatives; discussing policies with students and asking for their opinions; and publicly supporting relevant student activities by broadly publicizing personal statements from department leaders, such as the department chair and DGS.

- Work with experts from university mental health to make the best use of resources on campus and ensure that graduate students are aware of these resources and know how and where to get an appointment to speak with a therapist or mental health expert.
- Update policies to minimize unnecessary stress and improve mental health.
- Realize that paying attention to mental health is not a threat to research productivity; healthier students are more productive.
- Provide training for faculty, staff, and teaching assistants on how to deal with stress and support mental health.

University Mental Health Services are asked to

- Consider mental health a high priority for policies and strategies at all levels.
- Create opportunities for events and discussions on the topic of mental health that engage the whole university and all units; inspire administrators, faculty, and students to engage in those topics.
- Offer assistance not only to individuals struggling with mental health, but also take an active approach to prevention and supporting departments and student groups.
- Emphasize the importance of student empowerment for addressing the mental health challenge.
- With all the great ongoing efforts targeting undergraduate students, do not forget the graduate and professional students.
- Recognize that different colleges and departments often have different cultures and working environments: one size does not fit all. Help different units to develop the tools that work best for them, and let them help you promote mental health on campus.
- Promote a scientific approach to understanding mental health, e.g., through surveys and analysis.

ASSOCIATED CONTENT

Supporting Information

The Supporting Information is available on the ACS Publications website at DOI: 10.1021/acs.jchemed.8b00188.

Details of methodology and data analysis, and annual evaluation of graduate student progress (PDF)

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Notes

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