



UNIVERSITY OF NEBRASKA-LINCOLN COLLEGE OF ENGINEERING



GRADUATE STUDENT DEVELOPMENT AND MENTORING TASK FORCE

FINAL REPORT

March 16, 2018

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EXECUTIVE SUMMARY

Based on the work and scope of the Task Force on Graduate Student Development and Mentoring, below are the main recommendations:

GRADUATE STUDENT DEVELOPMENT.

1. Technical writing and presentation skills should be emphasized in each graduate program.
2. UNL COE graduates should be trained in responsible research practices.

GRADUATE STUDENT MENTORING

1. The scholarly performance of graduate students should be appraised annually.
2. The Complete Engineer Initiative should be adopted for graduate students.

STANDARDIZATION OF GRADUATE PROGRAM ADMINISTRATION POLICIES

1. Each program unit should implement a Qualifying Exam (QE), a format of which is at the discretion of the Graduate Program.
2. QE should test the students in the core knowledge of their chosen graduate program.

BUILDING AND STRENGTHENING A COLLEGE LEVEL GRADUATE COMMUNITY

1. The research programs within COE, including graduate student achievements, should be emphasized locally, nationally and internationally.
2. An Engineering Graduate Student Association should be established that sponsors community, social and educational events for all engineering graduate students

INTRODUCTION AND SCOPE

Charge

Identify best practices for creating and maintaining a consistent culture of excellence with regards to the graduate student experience across the College of Engineering (COE), for professional Master's students, M.S. and Ph.D. students. Among the questions to consider:

- What formal and informal education and training should we provide to all graduate students in the College of Engineering, if any?
- What should be the qualifications of Ph.D. students to teach in our undergraduate courses?
- How should they be trained and/or mentored?
- What should be the responsibilities of supervisors and supervising committees regarding grant writing, sending them to conferences, etc.?
- How can we build and/or strengthen a college-level graduate community?

Deliverables

Develop proposals for improving graduate student development to be enacted at the graduate program level and at the college level.

Aims

To conduct a survey and report findings that will lead to uniform graduate student development and mentoring across all departments in COE. Our main focus is to identify and advise on current/suggested skills and practices for developing competent, well-rounded graduates.

ACTIVITIES AND METHODOLOGY

To respond to our charge, we coordinated a three-step process, as described below.

STEP 1: Preliminary meeting to identify criteria

Our charter is to formulate broad and big picture ideas for improving and enhancing graduate student experience. There is also a need for college-wide consistency on good practices for mentoring and development. Keeping these ideas in mind, a meeting of graduate chairs (task force members) was convened on *October 19, 2017*. In our first meeting, we, as a group, identified universal skill sets that a COE graduate student should likely possess. We surmise that proposed actions regarding development and mentoring will enhance these skill sets. The following skill sets promoting graduate student development and mentoring were identified:

- Technical Writing Skills (research paper, report, and proposal writing)
- Presentation Skills (communication and persuasion)
- Research Skills (research ethics and integrity; ability to reach and defend conclusions)

- Professional Skills (e.g., time management, teamwork/collaboration, networking, interpersonal skills)

Step I: Action item

The discussion identified a necessary skill set for graduate students. However, we lacked information on our current practices across COE to help students learn those skills. Therefore, it was decided to create a survey instrument to be distributed to every graduate chair in COE. The purpose of the survey was to determine if any of the COE departments have formal or informal practices currently in place to develop in graduate students any or all of the skills identified above. **Please see Exhibit 1 for a sample instrument.**

STEP II: Analysis of survey results & development of discussion points

Members of the task force reconvened on January 16, 2018 to discuss the outcomes of the completed survey. Results were grouped into three categories, shown below. Findings and observations are listed under each corresponding category.

GRADUATE STUDENT DEVELOPMENT

- It was unanimously agreed upon that students graduating from COE must possess the following skills (technical writing, presentation, research and other professional skills)
- No graduate program in COE, as of date, requires graduate students to take one or more technical writing classes for credit
- 10 of the 12 graduate programs do not have a structured program (process) to help hone the presentation skills
- 10 of the 12 graduate programs do not have a structured program (process) to help hone their professional skills
- 10 of the 12 graduate programs do not have a structured program (process) to help hone their research skills (specifically ethics, integrity and ability to reach and defend conclusions)

GRADUATE STUDENT MENTORING

- There is utility to a systematic research progress evaluation and feedback to graduate students
- It ensures a more consistent training and development of graduate students.
- It can help a faculty advisor be an effective mentor
- The majority sentiment was that this function must reside with units and not be centralized

STANDARIZATION OF GRADUATE PROGRAM ADMINISTRATION POLICIES

- Majority of the graduate programs do not have a core curriculum
- Majority of the graduate programs have a WRITTEN qualifying exam.
- Clear rules and policies exist for the QE exam.
- At the Ph.D. level, a qualifying exam is recommended based on core classes from UG curriculum
- At the master's level, a qualifying exam was deemed unnecessary.

The results of the survey indicated there are deficiencies within the college in each of the three categories.

STEP II: Action item

Step II was very productive in the sense that each member had worthwhile contributions and comments to make. To efficiently collect and document the abundance of ideas and feedback, each member provided their input, pertaining to each category, in written form. One topic that came up during the discussion was that we had ignored “Building and Strengthening a College Level Graduate Community” in our previous discussions. It was decided to include this item in the next round of data collection.

A second instrument (**see Exhibit 2**) was developed and shared with all graduate chairs to solicit their input and ideas on how to enhance the graduate student experience at UNL. This instrument contained open-ended questions to allow individuals to share their thoughts and elaborate on their responses.

Step-III: Development of Recommendations

We used input from taskforce members to develop our recommendations. The key items are listed below. For a complete and unabridged listing of survey responses, **see Exhibit 3**.

GRADUATE STUDENT DEVELOPMENT

- It is recommended that training in research ethics be provided for all students (Responsible Conduct of Research)
- It is recommended that an ad-hoc committee at the COE level be instituted to investigate the creation of one or more optional technical writing classes for graduate students. The ad-hoc committee would evaluate the potential for developing an elective graduate class related to presentation skills to a wide range of audiences, including non-technical audiences
- It is recommended that along with their engineering courses, students take one-credit hour classes or workshops, commensurate with their deficiency level, to develop necessary skills with respect to technical writing
- The college should consider creating a set of continuing education events to help our graduate students hone their professional skills.

GRADUATE STUDENT MENTORING

- Provide an annual evaluation of each student by their advisor and/or degree committee with a clear feedback of their performance
- Potentially COE could suggest additional best practices related to mentoring of graduate students at each level of their development
- It is recommended that the Complete Engineer Initiative be adopted for graduate students

STANDARIZATION OF GRADUATE PROGRAM ADMINISTRATION POLICIES

- It is recommended that each program unit develop educational outcomes that focus on the core knowledge for that program of study
- It is recommended that each program unit implement a Qualifying Exam, (format would be at the discretion of the Graduate Program). It is recommended that the QE would test the students' core knowledge of their chosen graduate program

BUILDING AND STRENGTHENING A COLLEGE-LEVEL GRADUATE COMMUNITY

- It is recommended that an Engineering Graduate Student Association be established that sponsors community, social, and educational events for all engineering graduate students
- It is recommended that effective recruiting strategies be devised and implemented
- It is recommended that COE promotes, at a national and international level, the current research that is being conducted within the college
- It is recommended that graduate student stipends be revised to match national guidelines

EXHIBITS

EXHIBIT 1

SURVEY QUESTIONNAIRE 1

Your Name: _____

The program you represent: _____

Graduate Student Mentoring & Development Taskforce Graduate Chairs Survey

1. Upon graduation, which of the following types of skills do you believe graduate students in COE-UNL should possess? **Please check all that apply.**

____ Technical Writing Skills (Research paper, report, and proposal writing)

____ Presentation Skills (Communication & Persuasion)

____ Research Skills (Research Ethics & Integrity; Ability to reach & defend conclusions)

____ Professional Skills (e.g., Time mgmt., Teamwork/Collaboration, Networking, Interpersonal skills)

____ Other. Please explain:

2. Does your **program** require graduate students to complete one or more technical writing classes? ____ No. ____ Yes. Please specify:
3. Outside of course curriculum, does your **program** require graduate students to engage in any organized activity or program which is specifically designed **to strengthen technical writing skills**? ____ No. ____ Yes. Please elaborate:
4. Outside of course curriculum, does your **program** require graduate students to engage in any organized activity or program which is specifically designed **to strengthen presentation skills**? ____ No. ____ Yes. Please elaborate:
5. Outside of course curriculum, does your **program** require graduate students to engage in any organized activity or program which is specifically designed **to strengthen professional skills**? ____ No. ____ Yes. Please elaborate:
6. Outside of course curriculum, does your **program** require graduate students to engage in any organized activity or program which is specifically designed **to strengthen research skills**? ____ No. ____ Yes. Please elaborate:
7. Does your **program** have a **formal process** to conduct research progress evaluation of graduate students regularly (such as, semi-annually or annually)? ____ No. ____ Yes. Please elaborate:
8. Does your **program** have and follow a **formal process** to regularly (such as, semi-annually or annually) provide to graduate students feedback about their research performance so that they may adjust and/or improve & sharpen their research skills? ____ No. ____ Yes. Please elaborate:

9. As the graduate chair for your unit, do you believe a **systematic research progress evaluation and feedback system** would be beneficial to the graduate students? _____ No. _____ Yes. Please explain your response:
10. Currently, how many doctoral students do you have in your **program** who have been in pursuit of their Ph. D. in excess of 7 years? Please write the count of students: _____
11. Does your **program** require and/or encourage graduate students to take courses with content that primarily include topics on Ethics & Integrity in Research, Social Responsibility, and alike? _____ No. _____ Yes. Please elaborate:
12. Does your **program** have a formal requirement for all graduate students to prepare them and develop their skills outside of the classroom experience? _____ No. _____ Yes. Please elaborate:

The following questions pertain to standardization of graduate program administration policies

13. Does your **program** have a core curriculum requirement for graduate students? _____ No. _____ Yes, for Master degrees _____ Yes, for Ph. D. degrees
14. Does your **program** have a written comprehensive exam? _____ No. _____ Yes. If yes, then:
- A. At what point in their curriculum must the student take the exam?
- B. Does your **program** have clear rules and policies published for the exam? _____ No. _____ Yes
15. Does your **program** have an oral proposal/thesis comprehensive exam? _____ No. _____ Yes. If yes, then: Are students required to write a proposal? _____ No. _____ Yes.
 _____ Other form of oral exams? Please elaborate:
16. In your opinion, should some type of qualifying exam be required of all CoE UNL graduate students? _____ No. _____ Yes. If yes, should it be based on: _____ Graduate course work? _____ UG course work

In the space below, please share any remarks, ideas, issues, or concerns that you deem appropriate to our discussion of Graduate Student Mentoring and Development, which were not included in this survey.

EXHIBIT 2*SURVEY QUESTIONNAIRE 2***Develop proposals to build and/or strengthen a College level graduate community?**

Please send your ideas or proposals to improve the deficiencies identified in each of these categories. The plan is to collate the narrative, discuss and present it to units and Dr. Pérez.

A. GRADUATE STUDENT DEVELOPMENT

Your name here:

B. GRADUATE STUDENT MENTORING

Your name here:

1. *While the onus rests on an advisor, perhaps departments can debate innovate ways to provide wholesome feedback.*

C. STANDARIZATION OF GRADUATE PROGRAM ADMINISTRATION POLICIES

Your name here:

1. *I feel that QE is a must and must act as a filter.*

2. *I would like to hear for interdisciplinary programs will administer a QE? a. As they do not have a core undergraduate curriculum?*

D. How can we build and/or strengthen a College level graduate community?

Your name here:

EXHIBIT 3*UNABRIDGED RESPONSES OF SURVEY QUESTIONNAIRE 2*

Please send your ideas or proposals to improve the deficiencies identified in each of these categories. The plan is to collate the narrative, discuss and present it to units and Dr. Pérez.

GRADUATE STUDENT DEVELOPMENT**Lau:**

1. I suggest to have a college level – **1-credit class or seminars for the following important skills** that are expected from graduate students:
 - a. Effective presentation (both preparing an effective visual aid as well as oral presentational skills)
 - b. Use of library for information, and how to do a literature review
 - c. Research ethics
 - d. IRB
 - e. Time management
 - f. Teamwork/Collaboration, Networking,
 - g. Interpersonal skills (encourage or requires our students to join and serve on a professional society student branch)
 - h. Etc.

2. I suggest a class during a regular semester or summer semester (should be 3 credits) with regular homework or projects to train students' **writing skills** (especially on academic/technical writing and how to paraphrase and citing materials) and the danger of **plagiarizing** (and the potential consequence).
3. Since I am a faculty from Scott Campus (Omaha), I would like to ensure that **all the above classes/seminars** should be either in a classroom that supports **web-stream real-time or on both campuses**. So, our students don't have to commute to Lincoln for one class. (I had students who have to delay their English classes because of a schedule conflict with the commuting time - but, it would have been resolved if it was offered on the same campus).

J. Asgarpoor:

1. Start a College of Engineering **Writing & Communication Resource Center** (WCRC) for use by graduate (or even undergraduate) students. Hire graduate students majoring in English and Communications, or full-time experts to work at the resource center to help students. The staff must have expertise in technical writing and communication.
2. Upon admission into graduate program, students must take a **placement test** to determine deficiency level for **written and oral communication skills** (let's say, levels 1 to 5).
3. Along with their engineering courses, **student must take one-credit hour classes or workshops, commensurate with their deficiency level to develop necessary writing/communication skills**. These classes would be taught by the WCRC staff. At the end of each credit hour, skills will be assessed to move up to the next level until all 5 levels are completed successfully.
4. Some kind of **writing assignment to be required in ALL classes**, even if it is a 2-page article review, report, or research summary. Assignment must be submitted to Turnitin.com or anti-plagiarism function of Canvas. If it is less than X% original, it must be re-submitted until it meets minimum "originality" criterion. The assignment will receive two grades: one for English proficiency, graded by the WCRC staff, and one for technical content by the faculty. Student is required to revise the paper for English content and writing style until it earns a grade of X% or better.
5. M.S. or Ph.D. students must **submit their research proposal**, and all drafts of their thesis or dissertation to the WCRC staff for review and feedback on technical writing style prior to submission to their committee chair and members.

6. Start **speaker series** at the college level and bring nationally- and internationally-renowned individuals to present **so all students are exposed to good research, speaking, and presentation style.**
7. Start a semi-annual or annual **UNL College of Engineering Graduate Student Conference** (3 days long or 5 days long) modeled after national conferences with tracks, session chairs, and concurrent sessions, where all graduate students must present. Presentation, participation, and attendance must be mandatory for all graduate students in the college of engineering.
8. Currently professional engineering societies such as ASCE, IEEE, ASME, AICHE, etc., only have active membership by UG students. Why not **involve the graduate students to participate** in those activities such as philanthropy, fundraising, volunteering, and involvement in programs and activities that are technical in nature? This will help develop them ethically, socially, interpersonally, etc.

Bashford:

1. I wonder if we use the **Writing Center enough in our graduate programs.** It has been very useful to BME, especially international students.
2. BME is currently **considering a seminar class to help students hone presentation skills.**

Li:

1. Offer a **technical writing class/presentation course** in the college level and make it a requirement for all graduate students. This could also be something offered in summer.

Sharif:

1. It is clear we need to have some formal way to support our graduate students for educating and training them for **stronger technical writing, presentation and other professional skills. This could be in form of a course or a workshop or online training modules.** I don't see a need to have this as a required element of graduate program since some graduate students have mastered these skills. But there should be formal support elements available for the grad students in this area.

Dvorak:

1. I suggest that an ad hoc committee be developed to **investigate the creation of one or more optional technical writing class for graduate students be developed.** This would be up to each graduate program, and potentially each graduate committee to determine which students would take the class.
2. The ad hoc committee could evaluate the potential to develop an elective graduate class related to presentation skills to a wide range of audiences, including non-technical audiences.
3. The college should consider creating a set of continuing education events to help our graduate student hone their professional skills.

Subramanian:

1. I propose that **1-credit class or a 6-unit seminar series be offered** at the COE level that is required for all graduate students in their first year of residence. Perhaps this class **can highlight the importance of technical writing in professional success** either as a scholar or an entrepreneur or an administrator and direct the students to various technical writing resources available within UNL.
2. Further, perhaps each unit can offer a **1-credit or 6-lecture advanced technical writing seminar** to their upper level graduate students (in their second or third year of residence). Just like the Grant writers workshop.
3. I also propose that each unit institute a **graduate seminar series where each student makes a 15-minute presentation; 2 students per seminar**. Yes, it will take effort on part of the graduate chair and department to pull this off; but this will give the students to present to their peers and hone their skills.
4. **Requiring a certain number of first author publications** may ensure technical writing on their part; but I remain skeptical as most PIs are writing the papers.
5. I propose that a seminar series on research ethics and responsibility be instituted at COE level. We have staff with ORED who can drive this initiative.
6. COE has a travel grant; this can help their professional and mentoring skills.

*GRADUATE STUDENT MENTORING***Lau:**

1. How about have a few “senior” Ph.D. **students share their experience** with fresh incoming graduate students? (like seminar or welcoming orientation)

J. Asgarpoor:

1. At the college-level: The six criteria that the college has adopted for UG engineering program (i.e., the **Complete Engineer initiative**) **must be emphasized and drilled into our grad students as well**. Those are:
 - Understanding of engineering ethics
 - Intercultural appreciation
 - Teamwork
 - Self-management
 - Service and civic responsibility
 - Leadership
2. Leverage the existing Complete Engineer’s Conference that the college organizes to reinforce the six bullets listed above. Require our grad students to attend the conference.
3. At the college-level: International students have a tendency to form cliques and do not assimilate into the American culture. This can be problematic as they graduate and start working in academics or industry, not able to relate to cultural norms and standards. Although it is not possible to force interactions outside of the academic realm, perhaps a **short workshop to indoctrinate them into the American culture and way of life may be in order**.
4. Start **departmental mentoring program** where upper-class graduate students are teamed up with incoming students to mentor them and guide them in various ways: academically, culturally, etc.

5. **Departmental weekly or monthly seminars** on Friday afternoons where all grad students are required to attend and participate as one or more of their peers present on a topic of their choice or chosen by their advisor.
6. **Form a COE Graduate Student Advisory Council** with two representatives from each department. The Council's **purpose is to promote communication between departments**. The Council will meet regularly to share experiences and best practices in various areas, to identify needs in each area, and to report back to the Graduate Chair in their department so that best practices can be adopted and applied uniformly across the college. The Graduate Chairs will act as the "advisors" to the Council and will facilitate and oversee the process.

Bashford:

1. I think it would be helpful to have a **yearly 'review' of a student by her/his advisor and/or committee, discussing goals and progress**. For example, if a student is expected to publish N papers during their program, and have a comprehensive exam completed by year N, the yearly review could assess the likelihood of the student achieving those goals for the current year, and make appropriate adjustments.

Li:

1. **Develop department level standard check list** for students to fill in regularly. For example, on the annual evaluation form, students and advisor need to check out whether the memorandum of courses was filled out on time, etc.

Sharif:

1. **Student mentoring** is important and could be achieved in two ways. The department or perhaps the college can provide some cultural mentoring for the international student while the advisor can assist with the technical mentoring by teaming up more senior grad students with the upcoming ones.

Dvorak:

1. In my unit, we have the student and graduate faculty advisor **complete an annual report**, which is intended to help force some discussion of topics **that relate to mentoring**. Potentially the college could suggest additional best practices related to mentoring of graduate students are each level of their development.

Subramanian:

1. While the onus rests on an advisor, perhaps departments can **debate innovate ways to provide wholesome feedback**.

STANDARIZATION OF GRADUATE PROGRAM ADMINISTRATION POLICIES

Lau:

1. I also suggest having a **list of core required classes** (either the student already taken during his/her undergraduate program or should have taken them during their studies in UNL of their department)
2. **The topics/scope of QE should be based on the student's research focus.** In AE program, we allow our students to focus on a discipline of the AE program (like lighting, acoustic, mechanical, structural, etc.) (QE should include materials from both undergraduate and graduate level classes)
3. **Annual evaluations of the Ph.D. students** that are documented and reported to the department (the evaluation should include publication, research progress, and the semester GPA. The department will write warning letters to students if they are not doing well in the classes, for example.

J. Asgarpoor:

1. What do we want our graduates to know and do at the minimum and at the most fundamental level? **Develop educational outcomes for each program**, focusing on the core knowledge base that a student must have upon graduation. Faculty in each program (whether it has a unique home base, or is multi-disciplinary) must discuss and identify that body of knowledge (BoK).
2. The **same faculty must identify UG courses** that best contain the BoK identified in item 1.
3. The **same faculty must create QE to test the students' knowledge level**, and also agree on a minimum performance target level for all students so that passing criteria is followed uniformly and consistently.
4. **Students must be advised upon admission into program that they must pass a QE and be notified of the BoK.**

Bashford:

1. I like the idea of a QE, but think it would be very hard for BME because of its breadth. I would be interested in hearing what other interdisciplinary programs are doing. Perhaps **some kind of "advanced FE" exam that includes life sciences.**

Li:

1. I agree that QE is extremely important. However, at department level, we have difficulty to develop a standardized procedure for QE for each discipline. I can see that it will be **helpful if a COE level guideline is available.**

Sharif:

1. *(Regarding: I feel that QE is a must and must act as a filter)* I do **think this is necessary for the PhD programs**, but not needed for the MS programs. This is very important for the PhD students since it provides a fair way of gauging their technical background, especially for our college since most of our PhD students are from overseas and they come from different technical backgrounds.

2. (Regarding: I would like to hear for interdisciplinary programs will administer a QE?) **This could work if the programs agree and see benefits for it.**
3. (Regarding: As they do not have a core undergraduate curriculum?) There could be changes if such departments feel there is a need for interdisciplinary QE. In general, **I feel this depends on the department and curriculum.**

Dvorak:

1. **For the Ph.D. level, I agree that a QE should act as a filter.**
2. **For M.S. programs, a qualifying exam is unneeded.** But an exam like a qualifying exam can be used as the exam for Option II. In the Environmental Engineering area, we use a portion of the Ph.D. qualifying exam in CIVE as the option II written exam.
3. **EnvE has a core curriculum.**

Subramanian:

1. I feel that **QE is a must and must act as a filter.**
2. I would like to hear for interdisciplinary programs will administer a QE? a. As they do not have a core undergraduate curriculum?

BUILDING AND STRENGTHENING A COLLEGE-LEVEL GRADUATE COMMUNITY?

Lau:

1. **Student events** (or some community outreach activities with COE graduate students)
2. Student's **poster and research seminar** (within the department and the college level)

J. Asgarpoor:

Walk the walk, don't talk the talk! Faculty must act as leaders and role models for their students. In college functions such as faculty meetings, college connectors, committees, events, and social gatherings, few faculty participate. **If the faculty doesn't have a sense of community, how can we expect the students to learn from us and build community and a sense of belongingness?** Perhaps WE should be required to go through some leadership, organizational behavior, and teamwork training before we expect our students to learn and practice those skills ☺ And, perhaps this item should be coordinated with the charge that is given to the Faculty Development and Mentoring Taskforce.

Bashford:

1. I think for this, **it is important that we work well with one another rather than compete with one another.** Using our individual programs' strengths to build one another up is the key to making everyone proud to be a UNL graduate engineer.

Li:

1. **More social events** for graduate students and faculty to participate.

Sharif:

1. Building **effective recruiting**.
2. **Advertise current research work** in the college nationally and internationally. Support from departments and our college for group visits to where the source of potential graduate students are (e.g., group visits to some foreign well-known universities to highlight the faculty research and exposure of faculty to potential graduate students).
3. **Increase the graduate student stipends**.
4. **Build and promote an effective social media to connect UNL Engineering College alumni**: share and highlight their success on the college and department websites. Some of these may exist now, but we need more effective effort in this area.

Dvorak:

1. Potentially a **program of continuous improvement seminars and sessions** could be used for the graduate students, and potentially sharing best practices through presentations at departmental faculty meetings could be used to challenge the faculty in terms of mentoring.