The Mandra of Graduate Education Reform: Why the Prayers Aren’t Answered

Michael T. Ashby
Department of Chemistry and Biochemistry

University of Oklahoma
Educational Assessment

The systematic process of documenting and using empirical data on the knowledge, skill, attitudes, and beliefs to refine programs and improve student learning.
Educational Assessment

The systematic process of documenting and using empirical data on the knowledge, skill, attitudes, and beliefs to refine programs and improve student learning.

Note that this definition does not mention the teacher.
Educational Assessment

The systematic process of documenting and using empirical data on the knowledge, skill, attitudes, and beliefs to refine programs and improve student learning.

Note that this definition does not mention the teacher.

But the foundation of the apprentice model for graduate educations is the pairing of a teacher with a single student.
Some Reasons Why Assessment of Ph.D. Programs is Problematic

1. By definition, the “curriculum” used to train a Ph.D. is unique (the population is highly heterogenous).

2. Faculty are resistant to experiment with new approaches to training graduate students (graduate education is steeped in tradition).

3. The IRB has determined that graduate students meet the criteria of an “at risk” population.

4. We simply do not have the tools.
Two Vignettes

• The 10,000 foot view: national studies on the future of graduate education

• The 1 foot view: individual students
Two Vignettes

- **The 10,000 foot view:** national studies on the future of graduate education

- **The 1 foot view:** individual students
There Has Been One or More National Study on the Future of Graduate Education Every Year For the Past Three Decades!

1998. AAU Committee on Graduate Education. Report and Recommendations.
2005. NRC. Policy Implications of International Graduate Students and Postdoctoral Scholars in the US.


2010. CGS. PhD Completion and Attrition: Policies and Practices to Promote Student Success.
2010. CGS and Educational Testing Service. The Path Forward: the Future of Graduate Education in the US.

**2012. American Chemical Society, Advancing Graduate Education in the Chemical Sciences.**

2013. American Chemical Society. ACS Graduate Student Survey. Washington, DC.
2017. CGS. Professional Development: Shaping Effective Programs for STEM Graduate Students.
2017. NAS, Revitalizing Graduate STEM Education for the 21st Century
Common Denominators: Time to Degree

The Path Forward: The Future of Graduate Education, Commission on the Future of Graduate Education in the United States, 2010: “... the public and private costs of a longer-than-necessary time to degree completion, and the benefits to the public and to the individual recipient of a degree awarded, mean that students should complete as efficiently as possible.”

Advancing Graduate Education in the Chemical Sciences, American Chemical Society, 2012: “Four years should be the target for completion of the Ph.D. degree ...”

Biomedical Research Workforce Working Group Report, National Institutes of Health, 2012: “To encourage timely completion of graduate degrees, NIH should cap the number of years a graduate student can be supported by NIH funds ... with an institutional average of 5 years.”
The Path Forward: The Future of Graduate Education, Commission on the Future of Graduate Education in the United States, 2010: “... the public and private costs of a longer-than-necessary time to degree completion, and the benefits to the public and to the individual recipient of a degree awarded, mean that students should complete as efficiently as possible.”

Advancing Graduate Education in the Chemical Sciences, American Chemical Society, 2012: “Four years should be the target for completion of the Ph.D. degree …”

Biomedical Research Workforce Working Group Report, National Institutes of Health, 2012: “To encourage timely completion of graduate degrees, NIH should cap the number of years a graduate student can be supported by NIH funds ... with an institutional average of 5 years.”
Common Denominators: Broaden Experience

The Path Forward: The Future of Graduate Education, Commission on the Future of Graduate Education in the United States, 2010: “A professional development component is one of the strengths of graduate education. However, it is primarily master’s level programs, not doctoral, that have included this component. Universities should support the acquisition of such transferable skills to prepare doctoral recipients for a larger array of employment opportunities.”

Advancing Graduate Education in the Chemical Sciences, American Chemical Society, 2012: “… curricula need to be refreshed, and better-designed opportunities should exist for the development of critical professional skills”

Pathways through Graduate School and Into Careers, Council of Graduate Schools, 2012: “Broaden the focus of graduate education to include development of professional skills.”
The Path Forward: The Future of Graduate Education, Commission on the Future of Graduate Education in the United States, 2010: “A professional development component is one of the strengths of graduate education. However, it is primarily master’s level programs, not doctoral, that have included this component. Universities should support the acquisition of such transferable skills to prepare doctoral recipients for a larger array of employment opportunities.”

Advancing Graduate Education in the Chemical Sciences, American Chemical Society, 2012: “… curricula need to be refreshed, and better-designed opportunities should exist for the development of critical professional skills”

Pathways through Graduate School and Into Careers, Council of Graduate Schools, 2012: “Broaden the focus of graduate education to include development of professional skills.”
**Time** and **Content**
Must Be Treated As Commodities
Time and Content
Must Be Treated As Commodities
Time and Content
Must Be Treated As Commodities
Time and Content Must Be Treated As Commodities
My first question.

From the perspective of …

1) Your discipline (e.g., history, biology, chemical engineering …)

2) Your role in graduate education (e.g., graduate student, postdoctoral, faculty member, department chair, …)

Should the time to degree be reduced from its current average (in your field) by twenty-five percent?

☐ Most important to advance graduate education

☐ Less important to advance graduate education

☐ Do not agree with the recommendation
Working Together to Advance Graduate Education in the Chemical Sciences

CALL TO ACTION
Help prioritize the recommendations of the ACS study:
Advancing Graduate Education in the Chemical Sciences

Complete the Survey
• Outside the twenty-two members of the ACS commission that drafted the 2012 report, the community has not until now been queried as to whether they agree with their recommendations.

• We recently asked the entire community of stakeholders of chemistry doctoral education—undergraduates who plan to go to graduate school, graduate students in various stages of their studies, recent graduates and postdoctoral fellows, faculty, administrators, and employers—to indicate their level of support for the 32 recommendations of the ACS study.

• More than 1300 responses were received.
Some of the recommendations are universally popular.

Additional professional skills should be incorporated into graduate curricula.

Not as important?
Some of the recommendations are not popular.

Require at least two research proposals, at least one in the student’s field.
Faculty/mentors are sometimes out of step.

The current time to degree of 6-7 years should be shortened to less than 5.
My first question.

From the perspective of …

1) Your discipline (e.g., history, biology, chemical engineering …)

2) Your role in graduate education (e.g., graduate student, postdoctoral, faculty member, department chair, …)

Should the time to degree be reduced from its current average (in your field) by twenty-five percent?
My first question.

From the perspective of …

1) Your discipline (e.g., history, biology, chemical engineering …)

2) Your role in graduate education (e.g., graduate student, postdoctoral, faculty member, department chair, …)

Should the time to degree be reduced from its current average (in your field) by twenty-five percent?

By relaxing the rigors of education?
My first question.

From the perspective of …

1) Your discipline (e.g., history, biology, chemical engineering …)

2) Your role in graduate education (e.g., graduate student, postdoctoral, faculty member, department chair, …)

Should the time to degree be reduced from its current average (in your field) by twenty-five percent?

By relaxing the rigors of education?

By reducing research productivity?
My first question.

From the perspective of …

1) Your discipline (e.g., history, biology, chemical engineering …)

2) Your role in graduate education (e.g., graduate student, postdoctoral, faculty member, department chair, …)

Should the time to degree be reduced from its current average (in your field) by twenty-five percent?

By relaxing the rigors of education?

By reducing research productivity?

By eliminating the use of graduate students as teaching assistants?
My first question.

From the perspective of …

1) Your discipline (e.g., history, biology, chemical engineering …)

2) Your role in graduate education (e.g., graduate student, postdoctoral, faculty member, department chair, …)

Should the time to degree be reduced from its current average (in your field) by twenty-five percent?

By relaxing the rigors of education?

By reducing research productivity?

By eliminating the use of graduate students as teaching assistants?

By making students work seven day a week and 360 days a year.
A parting thought regarding the first vignette.

A plethora of national studies of graduate education over the past two decades has yielded similar recommendations for reform, but very little action.

Reform is unlikely unless the pains and needs of each stakeholder group are recognized and addressed - including, and especially, those of students.

Herein lies a fundamental challenge: graduate students and early-career faculty are not forthcoming when asked to critically evaluate graduate education.
Two Vignettes

• The 10,000 foot view: national studies on the future of graduate education

• The 1 foot view: individual students
Two Vignettes

- The 10,000 foot view: national studies on the future of graduate education

- The 1 foot view: individual students
Some Reasons Why Assessment of Ph.D. Programs is Problematic

1. By definition, the “curriculum” used to train a Ph.D. is unique (the population is highly heterogenous).

2. Faculty are resistant to experiment with new approaches to training graduate students (graduate education is steeped in tradition).

3. The IRB has determined that graduate students meet the criteria of an “at risk” population.

4. We simply do not have the tools.
My second question.

If you are a graduate student, by what means do you convey your needs to the faculty?

If you are a faculty member, how do you know you are meeting the educational needs of your graduate students?
1. We have formalized the use of Individual Development Plans during the annual graduate student evaluation process.

2. We have augmented the “apprentice model” of mentoring Ph.D. with a community approach.

3. We have implemented an annual “graduate student summit” so that concerns can be voiced with anonymity.
Approached we have taken.

1. We have formalized the use of Individual Development Plans during the annual graduate student evaluation process.

2. We have augmented the “apprentice model” of mentoring Ph.D. with a community approach.

3. We have implemented an annual “graduate student summit” so that concerns can be voiced with anonymity.
Individual Development Plans

myIDP ([https://myidp.sciencecareers.org](https://myidp.sciencecareers.org)) – is a career-planning tool tailored to meet the needs of PhD students and postdoctoral scholars in the sciences, with an emphasis on the biological sciences. The Federation of American Societies for Experimental Biology (FASEB) first proposed the project in 2003 and it is currently supported by the American Association for the Advancement of Science’s (AAAS).
ChemIDP (https://chemidp.acs.org) – is designed specifically for graduate students and postdoctoral scholars in the chemical sciences. The development of ChemIDP was supported by the National Science Foundation Innovation Corps (I-Corps) Teams Program and the American Chemical Society (ACS) Board of Directors.
ImaginePhD (https://www.imaginephd.com) – is designed specifically for graduate students and postdoctoral scholars in the humanities and social sciences. The ImaginePhD project is supported by the Graduate Career Consortium (GCC).
1. We have formalized the use of Individual Development Plans during the annual graduate student evaluation process.

2. We have augmented the “apprentice model” of mentoring Ph.D. with a community approach.

3. We have implemented an annual “graduate student summit” so that concerns can be voiced with anonymity.
Academic Mentoring During the 1st Year

- 5-Member Advisory Committee
- Major Professor and Disciplinary Representative
- Introductory Course Instructors
- Graduate Committee
# Research Mentoring During the 1\textsuperscript{st} Year

<table>
<thead>
<tr>
<th>August</th>
<th>September</th>
<th>October</th>
<th>November</th>
<th>December</th>
<th>January</th>
<th>February</th>
<th>March</th>
<th>April</th>
<th>May</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department Colloquium</td>
<td>Funda. 1</td>
<td>Rotation 1</td>
<td>Rotation 2</td>
<td>Intermediate Inorganic Chem</td>
<td>Breadth 1</td>
<td>Breadth 2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>January</th>
<th>February</th>
<th>March</th>
<th>April</th>
<th>May</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department Colloquium</td>
<td>Fundamentals 2</td>
<td>Inorganic Colloquium</td>
<td>Advanced Inorganic Chem (AIC) 1</td>
<td>AIC 2</td>
<td>AIC 3</td>
</tr>
</tbody>
</table>

- **5-Member Advisory Committee**
- **Major Professor**
- **2\textsuperscript{nd} Rotation Advisor**
- **1\textsuperscript{st} Rotation Advisor**
1. We have formalized the use of Individual Development Plans during the annual graduate student evaluation process.

2. We have augmented the “apprentice model” of mentoring Ph.D. with a community approach.

3. We have implemented an annual “graduate student summit” so that concerns can be voiced with anonymity.