

Faculty perceptions of their graduate education

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Published online: 5 November 2015
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Abstract Most studies of graduate school socialization utilize samples of either current students or recent graduates. This study investigates how professors, established in their academic careers, retrospectively view their graduate training by asking and examining what deficiencies they detect from this preparatory stage. The sample is composed of academics at different stages of their careers, who work in a spectrum of institutional types in the US system of higher education. Four analytic dimensions are used to examine variation in which professors identify deficiencies in their graduate training: time (as indicated by career stage), employing institution, Ph.D. institution, and publication productivity. The findings cast additional light on socialization by suggesting how academics, differentially situated in an academic career, view their graduate education years after it has concluded.

Keywords Graduate education · Socialization · Faculty · Careers

Introduction

There are arguably no other events as consequential to the conditioning of an academic career as one's graduate education. Even in the physical and biological sciences, where postdoctoral appointments possess significant instrumental importance for subsequent career attainment, the appointment itself is a function of graduate study, where and with whom it was done, and how well it was completed (Fox and Stephan 2001; Horta 2009;

A version of this paper was originally presented at the annual meeting of the Consortium of Higher Education Researchers (CHER) in Lausanne, Switzerland.

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Stephan and Ma 2005). To be certain, experiences as part of the academic career, from the first year onward, provide crucial lessons for how to initiate, conduct, and complete work, as well as how to relate with others, across the spectrum of roles that academics perform as researchers, educators, and citizens of institutional communities (Hermanowicz 1998; Neumann 2009).

But it is graduate education that decisively sets academics on their professional paths (Merton et al. 1957). It typically includes a transformative process of socialization wherein a lay identity is converted into a professional one that encompasses newly acquired specialized knowledge, skills, techniques, values, and attitudes (Antony 2002; Austin and McDaniels 2006). As part of socialization, norms are transmitted and internalized such that they ideally become self-imposed rather than exclusively managed by external regulation (Braxton and Baird 2001; Hermanowicz 2012). The transformational purpose of graduate education, made characteristically noteworthy by ardor and shared ordeals (Austin 2002a; Bosk 1979; Becker et al. 1961), lends itself as a major point of reference in careers. Long after graduate education has ended, academics may often look back to their training: to sort out and comprehend its effects, to search for ways to address present problems, to guide behavior, to evaluate and judge work and the people who produce work, and in turn to train others. While occasions for looking back at this highly consequential time are likely numerous, it remains unclear how people actually regard their graduate training well after it has ended. How do professors view their graduate education? Answers to the question cast new light on the quality of socialization and how practitioners understand its effects in academic careers.

Background

This article investigates how academics, established in their careers, retrospectively view their graduate education. Research on the sociology of academic careers leaves little question that graduate education plays a decisive role in subsequent outcomes, including academic employment, placement, productivity, and attainment. Long (1978) and Long et al. (1979), using a sample of biochemists, found that graduate education, sponsorship, and postdoctoral study played a more prominent role in initial academic employment than publication and citation. “Academic departments may recruit on the basis of the prestige of the mentor and the doctoral department because they have insufficient evidence of the young scientist’s productivity. But nonetheless, this initial decision to hire, based on where one studied and with whom, has a major effect on the career...” (Long 1978, 906). Research has also established that initial employment, conditioned by graduate schooling, exerts highly consequential effects on the ensuing academic career. The correspondence between productivity and prestige of initial academic position may at first be weak, but the effect of departmental prestige on productivity increases over time (Long 1978).

These patterns are consistent with findings by Allison and Long (1990), who concluded that the effect of department affiliation on productivity is more important than the effect of productivity on departmental affiliation. But it is early productivity, conditioned by location, that most accounts for productivity in the decade following the Ph.D. (Reskin 1977). The patterns together support a theory of cumulative advantage (Merton 1977; Zuckerman 1977, 1988). Early rewards position individuals and groups to receive additional rewards and resources, which enables still further achievements along with the rewards and resources that simultaneously recognizes and makes possible continued

accomplishment (Allison et al. 1982; Allison and Stewart 1974). Graduate education plays a prominent part in this sequential process, for in many academic careers the spiraling effects of professional advantages begin in this phase.

It is, then, important to consider what does and does not happen in this phase of a career. While socialization processes are as much a feature of ending careers in retirement as in beginning careers in graduate school (Baldwin et al. 2005; Hermanowicz 2009), researchers have focused preponderantly on the early period, concentrating on the phase of the professional life course concerned with the transition from student–apprentice to scholar, this stage often viewed as particularly momentous (Austin 2010; Austin and McDaniels 2006; Golde and Walker 2006; Ehrenberg and Kuh 2009; Ehrenberg et al. 2009; Nettles et al. 2006; Walker et al. 2008). To examine socialization processes and program efficacy, the research has concentrated on samples of two sorts of people: current students and recent graduates.

Austin’s studies of graduate students and criticisms of their training yielded five recommendations: more attention to regular mentoring, advising, and feedback; structured opportunities to observe, meet, and talk with peers; diverse, developmentally oriented teaching opportunities; information and guidance about the full array of faculty responsibilities; and regular, guided reflection on the nature and content of faculty roles (Austin 2002a, 111–112; 2002b; Austin and McDaniels 2006). In different work, focusing on STEM fields, Austin (2010) identified additional areas in which graduate students expressed dissatisfaction with their training. The areas cover a wide spectrum of socialization issues: preparation for academic work and for careers outside of academe; the development of scholarly competencies, involving conceptual understandings of a field, knowledge, and skills relevant to their area of study, interpersonal skills, and professional attitudes and beliefs; advising and mentoring, which students wish to be clearer, more frequent, and more expansive; a sense of community, in which students feel they can turn to advisors and not only friends for support and belonging; quality of life, wherein students are able to ascertain ways in which academics navigate and integrate professional and extra-professional life domains.

Golde and Dore (2001), using survey results from 4114 graduate students in 11 fields at 27 institutions, examined discrepancies between expectations and experiences in the socialization process, and made recommendations that centrally involve the advisor–advisee relationship. All of the recommendations entail a greater explicitness and deliberateness of achievement expectations and preparatory experiences, including the transmission of values and ethics in academic work; the adoption of annual student reviews; involvement in activities and opportunities even if they may partially take students away from research; examination of the structure and content of courses to ensure they contribute to both breadth and depth of training; and discussion with students about their experiences.

Similar patterns are observed by Bieber and Worley (2006), who found that graduate student relationships with advisors often lacked depth, which in turn contributed to students’ inaccurate and idealized images of academic life and careers. What is more, despite professed interests in teaching, students’ socialization experiences were found to be heavily oriented to research, a widespread finding in the literature (Anderson 1998; Austin and McDaniels 2006; Golde and Dore 2001). These conditions likely contribute to a “reality shock” among those who succeed in eventually entering the professoriate, because expectations and reality are seriously discrepant (Hermanowicz 1998), and they potentially reinforce a disillusionment among those who do not realize such success, because career goals stressed in school are not met.

It is precisely a divide between expectation and reality that forms the core of Nerad et al.'s (2004) study of Ph.D. graduates 10 years after they had left their programs. Over half of the respondents aspired to become professors, yet only 28 % of them were employed in tenure-track positions as their first jobs after degree completion. The authors emphasize a need to broaden career information in graduate training, including information about Ph.D. production and employment prospects. In addition, they underscore a need to devote more time, money, and effort to career planning for graduate students, again paralleling points above that speak to developmentally oriented guidance in prospective academic and non-academic employment roles (i.e., what it means to be a professor and how professors go about their variety of work; what types of non-academic options are available to Ph.D.'s in a given field). Morrison et al. (2011), who studied social science Ph.D. graduates 5–10 years after their graduation, found that alumni assign high value to academic rigor and critical thinking, which they understood to form the most important qualities of an excellent graduate program irrespective of career goals. But graduates also assigned significant value to support in meeting program requirements, fostering a sense of belonging, and training in research skills—items similarly of central concern to Austin and McDaniels (2006).

Views of graduate education by current students and recent graduates provide important insight on the perceived quality of professional training and socialization, a phase of the academic career that carries cumulating consequences. But these are not the only perspectives to consider, even as research has concentrated on these types of respondents, and neither are they without their own limitations. Current students may lack a breadth of perspective, enabled by experience, to make valid judgments about program quality. Socialization processes, because they by definition involve a transformation, are invariably difficult and thus especially susceptible to criticism by incumbents. By turn, recent graduates may just be forming ideas about their graduate education in light of their new roles; their perspectives and judgments may change as their experience enlarges. What is more, recent graduates who have moved into academe are typically in the throes of yet another consequential and uncertain phase of the career—the untenured assistant professorship or a fixed term, non-tenure line appointment whose future is also uncertain. Uncertainty may make criticism more likely, including critical assessments of the path that has led to the present. A question remains about how academics, well into their careers, come to view their graduate education, and how their perspectives might vary with regard to a range of characteristics that their careers come to possess.

We can infer from the research on socialization several analytic dimensions relevant to understanding its effects. First, socialization occurs not only as a result of actors' actions but also as a function of time. It transpires in anticipation of something next and is thus predicated temporally. What is more, time grants perspective on how well socialization has been undertaken. Second, people within institutions do the socializing and live with its successes, failures, and flaws. But not all institutions are one of a kind in their production; they embody and impart significant differences, which may have translatable effects on socialization. Third, socialization is designed to equip people to perform in subsequent roles. Here, too, however, roles, like the institutions that organize them, are not monolithic. Different types of institutions stress varied practices. Finally, in the context of graduate education, the Ph.D. is fundamentally a research degree, and thus it centers attention on the capacities that graduates have to succeed as researchers and scholars. This is not to say that other roles are unimportant, but that achievement in research is a chief criterion of success for Ph.D. graduates, most especially those who enter academe.

In light of these considerations, the remainder of the article is structured by the following four propositions, which will guide a discussion of the data and findings. The four propositions cover the ways in which perspectives on past training are conditioned by: (1) time; (2) employing institution; (3) the institution in which academics earned their Ph.D., and; (4) their publication productivity. These are arguably not exhaustive of the analytic dimensions that may be used to understand the effects of training, but are, in ways reflecting the points above, taken to be central to socialization. The propositions are as follows:

Proposition 1 (Time) *Dissatisfaction with graduate education will be greatest in older cohorts of academics who have “time to grow dissatisfied.” Accumulating experience in an academic career allows more reasons for dissatisfaction to accrue. Socialization is typically connoted with the idea that graduates are equipped to make a relatively seamless and smooth transition to the faculty role, and that time for any adjustment is, or should be, relatively short. But as prior discussion has established, this is usually not the case; instead, new faculty members often experience “reality shock,” and their years on the job are filled with reconciling discrepancies between expectations and realities of academic work* (Hermanowicz 1998, 2009; Nerad et al. 2004). *Proposition 1 suggests that time in the academic role confers opportunity to see and understand deficiencies in one’s training.*

Proposition 2 (Employing institution) *Dissatisfaction with graduate education will be greatest at teaching-oriented institutions because: (a) academics will feel the least prepared to function in this type of institution, since; (b) this institutional type represents, on balance, the greatest contrast in mission from their doctoral granting institution. Prior work finds consistently that graduate training and socialization are preponderantly oriented to research* (Anderson 1998; Austin 2002a, b; Austin and McDaniels 2006), *and graduates often find themselves less prepared for subsequent teaching roles* (Golde and Dore 2001).

Proposition 3 (Ph.D. granting institution) *Dissatisfaction with graduate education will be greatest among academics whose doctoral degrees are from non-top-tier programs. More deficiencies in training will be attributed to programs that are not viewed as “among the best.” A major reason for ranking programs consists in how well faculty in those programs train the students in them. Program quality is associated faculty quality, and both are in turn indicative of the quality of training that students receive.*

Proposition 4 (Productivity) *Dissatisfaction with graduate education will be greatest among academics who publish the least of their work in high-quality outlets. Academics who end up publishing a majority of their work in lower-quality outlets will be the most critical of their training. The quality of publication productivity encompasses a major basis, if not what many graduate programs would take as the single greatest factor of, success in an academic career. It thus captures the extent to which graduates succeed in their roles as scholars. The proposition suggests that those who come to “fall short” will be most critical of their training.*

Data

Data for this article were generated by a larger study of academics' careers (Hermanowicz 2009). As part of the study, professors were interviewed about their perceptions of their careers, including ideas about success and failure, satisfactions and dissatisfactions, aspirations, and continuities and changes in career progress. The data sought to place academic careers in context by obtaining views about how faculty members experience their work and make meaning of their careers. To serve these goals, 55 academics were interviewed about their career understandings. All of the professors were physicists. Four of the 55 subjects were women, an over-sampling, but because of their small number, meaningful comparisons by gender are unable to be made in the present study. Interviews averaged 60 min in length. All were conducted by the author. The response rate of the study was 93 %.

Data on academics' perceptions of graduate school were derived from the question, "In thinking about your graduate training, what do you view as its greatest weakness or deficiency?" The question was followed by discussion. Responses were coded by the views discussed. The results are intended to be suggestive and not definitive of patterns in perceptions of graduate training.

Respondents were sampled by career phase (allied with Proposition 1) and institutional type (allied with Proposition 2). Thus, the present data allow a comparison of perceptions by the types of settings in which professors work and the career phases from which they have provided their views. The professors in the departments were sampled by three general career phases: mid, late, and "post," this latter-most phase including those in or near retirement. Thus, in the present work, all of the faculty members are at least at mid-career. This ensures a sufficient length of time on which to reflect and speak about graduate education from a degree of subsequent experience as a professor. The array of respondents, by institutional type and career phase, is presented in Table 1.

In the present study, mid-career academics have worked in academe between 13.0 and 17.3 years; late-career academics, between 20.3 and 33 years; "post" career academics, between 33.0 and 46.0 years. The average age of the mid-career academics is 47.0; late-career academics, 58.3, post-career academics, 71.1. All but seven of the respondents are full professors (the seven, associate professors). Thirteen of the full professors occupy endowed chairs. Of the 19 "post" career academics, 12 have officially retired, though many continue to work; the balance of 7 are near retirement (as gleaned from the interviews), and several of these respondents stated plans to continue their work upon retirement.

The institutions, and more specifically the departments of physics from which the individual respondents were sampled, were selected on the basis of their ranking in the

Table 1 Number of academics, by career phase and institutional type

Career phase	Research oriented	Research/teaching oriented	Teaching oriented	Total
Mid	8	6	7	21
Late	6	4	5	15
Post	9	5	5	19
Total	23	15	17	55

national assessment of programs conducted by the National Research Council (hereafter NRC; Jones et al. 1982; Goldberger et al. 1995). Top-, middle-, and bottom-ranked departments were selected in order to maximize a variety of academic careers.

The institutional types are situated along a research–teaching continuum. One type emphasizes research in the presence of teaching. These institutions, mostly private but some public, are elite research universities, such as, Princeton University, Johns Hopkins University, or the University of Michigan and have departments of physics ranked at or near the top of the NRC assessment. A second type emphasizes teaching in the presence of research. These institutions, mostly public, are regional comprehensive universities, such as the University of Toledo, the University of Tulsa, or Wichita State University, and include departments of physics that are ranked near the bottom of the NRC assessment. The third type constitutes a hybrid of these organizations in which there is a dual emphasis on research and teaching. These institutions are predominantly large state schools, such as the University of Missouri, the University of Kansas, or the University of Florida, and have departments of physics ranked in the middle of the NRC assessment.

For clarity, I will refer to these institutional types as “research oriented,” “teaching oriented,” and “research/teaching oriented.” All of the institutions in the sample offer graduate degrees in physics (though two of three institutions composing the “teaching oriented” type offer only masters degrees). Thus, it is understood that research and teaching are found in all three institutional types. The labels are intended to convey the preponderant “center of gravity” of work in, and the overriding organizational identity of, the institutions.

Copies of each of the respondent’s complete curriculum vitae were obtained, which provides a basis of understanding their perceptions of graduate training in light of their Ph.D. granting institution (allied with Proposition 3) and publication productivity (allied with Proposition 4). “Top” graduate programs in physics are designated as those constituting the top 10 as assessed by the NRC. At the time the academics were studied, these programs were (11, due to tie in rankings): Harvard, Princeton, MIT, University of California—Berkeley, Cal Tech, Cornell, Chicago, Illinois, Stanford, University of California—Santa Barbara, and Texas.

Quality of publication productivity is designated by those having published 75 % or more of their work in what the physics community considers its top-tier journals. This specific cutoff is used because it conveys selectivity of performance as indicative of being “at the top.” It also divides the sample into substantial (though not even) parts: 33 (or 60.0 %) of the sample are “top publishers”; 22 (or 40.0 %) are “outside the top” publishers. Journal articles are used because they are the standard medium of publication in physics. The measure therefore excludes idiosyncratic occurrences of books, monographs, edited volumes, and so on.

Findings

To frame the findings and analysis of data, the deficiencies in graduate training identified by the academics were coded and aggregated topically. Three broad topics encompass the variety of deficiencies identified. These include: “training,” “advising,” and “environmental conditions.” The topics are not always mutually exclusive; they interact as core elements of socialization. Codes were attributed to these topics, and understood as analytically distinct, on the basis of how respondents spoke of the deficiencies they identified.

The attributions are, thus, emic: the content of subjects' talk guided how deficiencies were categorized.

"Training" refers to preparation in research and/or in teaching and includes eight specific deficiencies as discussed by the respondents:

A. Training

I. Research

1. Content/technical aspects
2. Length
3. Breadth
4. Rigor
5. Course availability
6. Writing/publishing

II. Teaching

7. Preparedness
8. Public speaking

Illustration of such discussion includes remarks such as the following:

My training was too narrow. I felt like a complete idiot afterwards [upon leaving graduate school] because [I was not able to] recognize something as an important problem and I should have. This is manifest in many ways. I've been involved in faculty hiring and not recognized who a really good person is. I felt really foolish later, and probably a lot of that was that I was not following what was going on in the field. (Coded as "Breadth.")

Or, from a different respondent:

I think what I realize now is being able to write well and being able to write quickly. Getting your results written out is a major, major plus toward an academic career. And that was never mentioned when I was a graduate student, and it was never emphasized. I think a lot of people were very, very smart but floundered. They could get work done but couldn't get it written up, or they didn't know how to write it up. No one ever trained us how to write a scientific paper. We just kind of learned by osmosis. (Coded as "Writing/publishing.")

"Advising" refers to the advisor–advisee relationship and its effectiveness in promoting socialization. It includes six specific deficiencies as discussed by respondents:

B. Advising

1. Engagement (advisor with advisee)
2. Ego strength development/confidence building (of advisee)
3. Compatibility
4. Guidance in work direction
5. Information about academic careers
6. Information about non-academic careers.

Illustration of such discussion includes remarks such as the following:

What would have been better is if we [graduate students] had been more aware of other opportunities other than just academic positions. That's the problem with most

professors, I think. When you have Ph.D. students, most of the time you're training them in such a way that they're going to fit into some academic slot unless you consciously make an effort to at least make them aware of other things that they can do...I'm sure there are a lot of rewarding things that people could have been doing in many different areas of industry. And I remember some people [in graduate school] who couldn't get tenure track positions anywhere. (Coded as "Information about non-academic careers.")

Or, from a different respondent:

I had a hands-off advisor. He should have been more hands-on. He didn't know what was going on...In retrospect, I should have been more aggressive and I should have just gone to see him. I wasn't happy with the arrangement. He was a nice guy, but I wish I was trained more. I wish there were more of that. That was just the way it was: laid back, [not a sense of] going after things. (Coded as "Engagement.")

"Environmental conditions" refer to qualities of the general program or department. It includes three specific deficiencies as discussed by respondents.

C. Environmental conditions

1. Quality
2. Versatility (i.e., department is "center of the universe"; rigid)
3. Competition (between students)

Illustration of such discussion includes remarks such as the following:

It was a weak place. The intellectual stimulation was low. I basically had to teach myself in a significant way. The instruction was weak. It took me a long time to make that up. I was teaching graduate courses better than I was taught them. That was hard. (Coded as "Quality.")

Or, from a different respondent:

I liked the graduate school at —, and they did something that we [at this institution] don't do that's very good, and that is making students give talks. They produce students that are much more independent from the get go. It produces a certain amount of polish. [But it's] an Ivy League school, and it simply has the sense that it's the 'center of the universe.' They are definitely vulnerable to that disease. [There is a sense of] following fashion. You have to be doing the latest thing this week [coming out of] the Institute for Advanced Study. (Coded as "Versatility.")

Frequency of deficiencies by topical area is presented in Table 2. Thirty-six of the 55 respondents identified a deficiency in their graduate education, and when they did so,

Table 2 Frequency of deficiencies in graduate training

	Number	% of mentions
Training	23	38.3
Advising	14	23.3
Environmental conditions	4	7.0
None	19	32.0
Total	60	100.0 ^a

^a Does not add to 100 due to rounding

38.3 % of the mentions were in the area of training; 23.3 % in advising, and; 7.0 % in environmental conditions. Thus, aspects of training (i.e., preparation for the research and/or teaching roles) stand above advisory issues and environmental conditions as objects of criticism by professors' years after their graduate education ended.

Further still, of the deficiencies flagged in "training," *the vast majority pertained to research rather than to teaching*. Of the 23 comments about training discussed by the professors (Table 2), only four pertained to teaching issues. Three professors discussed the issue of "preparation," and just one the issue of "public speaking." Interestingly, these findings reinforce the pattern wherein when professors talk of deficiencies in their graduate school training, they are referencing preponderantly the realm of research.

Nineteen of the respondents (32.0 % of mentions; 35.0 % of the sample) identified no deficiency, itself a notable finding. A substantial portion of the sample—one in three respondents—comes to have such a harmonious view of their past training as to voice no criticism of it at all. Five of the respondents identified more than one deficiency—all of them identifying two. Let us fill in the picture and turn to a consideration of how perceptions of problems in graduate training vary: by time, employing institution, Ph.D. institution, and productivity, as manifest in the four propositions discussed above.

Time

How does graduate school look with the passage of time? A way to evaluate the question is by considering cohorts of professors and the perspectives they have come to hold on their training. Proposition 1 stated that dissatisfaction with graduate education will be greatest in older cohorts of academics because time will have allowed them to grow most dissatisfied. By this view, time confers opportunity to see and understand deficiencies. The data, however, do not support the claim. As Table 3 shows, those with the most "gripes" about their graduate training are the youngest members of the sample, those who were in mid-career when interviewed. Twenty-one (or 51.2 %) of the mentioned deficiencies were made by members of the mid-career cohort. In general, talk of deficiencies in graduate training seems to decrease over time. Twenty percent of the mentions were given by members of late-career cohort; 29.3 % by members of the post-career cohort, still markedly lower than the mid-career cohort. If perceived weaknesses in graduate training generally de-intensify with age, then a finding is that they *mean less, are overcome, understood as part of a larger perspective, and/or are forgotten with time*. They do not significantly accrue with time. Indeed, of those who spoke of *no deficiencies whatsoever* with their training, almost 50 % of them were members of the *post-career* cohort; more than a third were in the *late-career* cohort; just three, or about 16 %, were in *mid-career*. These patterns underscore a "diminution of effects" in time and may be one of the agreeable aspects of aging (Baltes and Baltes 1990).

Table 3 Frequency of deficiencies in graduate training, by cohort

	Mid-career	Late-career	Post-career	Total
<i>N</i>	21	8	12	41
%	51.2	20.0	29.3	100.0 ^a

^a Does not add to 100 due to rounding

Employing institution

Proposition 2 stated that professors employed at teaching-oriented institutions will register the greatest dissatisfaction with their graduate training. They will do so, the proposition contended, because academics in this type of institution will feel the least prepared, given the contrast in emphases between many graduate programs (which stress research) and the emphases of their present roles. The data, however, present a different picture. Table 4 demonstrates that talk of deficiency in graduate training is found across the types of employing institutions. Although the differences between institutional types are small, the greatest frequency of mentions is at research-oriented universities (41.5 %). Put differently, those in environments where the press of research is greatest are most apt to speak critically of their graduate education, even years after it has ended.

Ph.D. institution

Are professors who graduated from top 10 programs more critical of their training compared to those who did not? The data suggest it is the other way around, as Proposition 3 stated. Dissatisfaction with graduate education is greater among academics who earned doctoral degrees ranked outside the top 10 in physics. The proposition implied that ranking is indicative of quality, including the quality of training, and therefore, those from non-top-tier programs would have greater grievances of their graduate education. As Table 5 depicts, professors whose Ph.D.'s were earned from non-top programs voiced more deficiencies with their training (59 % of the mentions). But it is not as though the others are quiet. Forty-one and a half percent of the mentions come from those whose degrees were granted by top 10 departments. Being trained in a top-ranked program stops well short of immunizing future professors of identifying deficiencies in their education. Indeed, as the next set of data suggest, it may well generate its own form of critical reflection.

Productivity

Proposition 4 held that dissatisfaction with graduate education will be greatest among academics who publish the least of their work in high-quality outlets. Publication quality is

Table 4 Frequency of deficiencies in graduate training, by employing institution

	Research oriented	Research/teaching oriented	Teaching oriented	Total
<i>N</i>	17	11	13	41
%	41.5	27.0	32.0	100.0 ^a

^a Does not add to 100 due to rounding

Table 5 Frequency of deficiencies in graduate training, by Ph.D. institution

	Top 10	Other	Total
<i>N</i>	17	24	41
%	41.5	59.0	100.0 ^a

^a Does not add to 100 due to rounding

Table 6 Frequency of deficiencies in graduate training, by publication productivity

	Top producers	Outside top producers	Total
<i>N</i>	25	16	41
%	61.0	39.0	100.0

often taken as the single greatest indication of success in an academic career. The proposition implies that those who “fall short” are most likely to view their training critically. The data, presented in Table 6, are suggestive of a different story. Twenty-five (or 61 %) of the mentions are made by the top producers in the sample, whereas 16 (or 39 %) of the mentions come from producers “outside the top.” Put differently, those who are the most successful in publication turn out to be the most demanding and most expectant of high performance, which is reflected in their disproportionate propensity to find fault with their graduate education. What is more, top producers of research are more likely to be allied with graduate education and thus more likely in a routine of training others. The exposure to and involvement in graduate training may maximize opportunity to think about graduate education, including critical considerations of their own training in the past that they refine and reproduce in the present.

Discussion

Graduate training is consequential for careers, and academics often recall this stage to help navigate steps along the paths they take well after graduate education has ended. Research on graduate school socialization has typically relied on the perspectives of current students or recent graduates. The work has produced important insights on the problems and efficacy of programs. But additional perspective can come from those who, further removed from this stage, have established themselves in careers and, in so doing, acquired experience that casts different light on this transformative period.

This study, drawing on data from academics at mid, late, and post stages of their careers at a spectrum of institutions, found the following patterns. Identification of deficiencies in graduate education generally decreases among cohorts with *time*. As their careers transpire, academics learn and overcome or forget deficiencies stemming from their graduate training. What is more, a significant portion of academics do not identify deficiencies in their training at all; this pattern intensifies with time.

Regardless of the *type of employing institution*, academics identify shortcomings in their graduate training. Those who work at research-oriented institutions are marginally more likely to see deficiencies in this stage. Those whose *Ph.D. institution* did not have a top-ranked physics program were more likely to identify deficiencies.

Aside from the effect of time, differences in *publication productivity* most strongly differentiated academics’ attributions of problems in their training backgrounds. Professors who publish the majority of their work in top outlets are more likely to identify shortcomings in their training than are those who publish the majority of their work in other types of outlets. *The patterns suggest that, independent of where their Ph.D.’s were earned, academics most critical of their graduate training are those who are most involved in research and most successfully active in publication.* Such a profile is consistent with academics who are themselves most active in training graduate students and thus most reflective about quality of training, present and past. Short of the effects of time,

subsequent career involvement in the activities that are most strongly tied to graduate training provides a set of prompts that cause academics to be the most critical of their own preparation.

On the one hand, the findings imply that the quality of socialization will be most keenly felt in ensuing academic career stages by those who pursue research. The observation is reinforced by the possibility that those who do not publish a majority of their work in top outlets may have fared better in their publication performance had their graduate training been stronger. *This in turn suggests that current reform efforts, designed in part to expand a repertoire of training, should not diminish attention to research preparation.* Based on the findings, this conclusion is applicable to all types of institutions in which graduates get jobs, since faculty from all types of institutions (as represented in this study) expressed a need for greater research training. What is more, this finding transcends teaching: *despite where faculty work and their constellation of important roles, whether in a predominantly research, a predominantly teaching, or a hybrid-type institution, they consistently turn to research as the area in greatest need of attention in their graduate preparation.*

On the other hand, the findings—by design—do not include perceptions from these academics when they were in their earliest career stages. It is conceivable that deficiencies not mentioned, were worked out in their early careers. Here we can rely on the value of research, discussed at the outset, whose findings on the efficacy of socialization are drawn from recent graduates (Austin 2002a, b; Austin and McDaniel 2006; Golde and Dore 2001).

The variety of deficiencies mentioned is a possible flag for a lack of coherence and consistency across and within programs. One field was studied, but seventeen different types of problems in graduate education were raised. Physics is generally understood as a “high-consensus field” in both its experimental and theoretic branches (Hargens 1975; Hermanowicz 2009; Braxton and Hargens 1996). That is, its members are characterized by a relatively high degree of agreement on the field’s practices. That there would be seventeen types of problems associated with graduate education raised by members of a *high-consensus* field suggests that the number might be greater in low-consensus fields, such as sociology, English, anthropology, and comparative literature. Based on the evidence presented herein, it would not be surprising for a study that encompassed more fields to find more problems, and problems of greater variety—an issue of worthwhile future empirical inquiry. The situation prompts the question: How should Ph.D.’s be trained? What should they know and be equipped to do? The questions are critical to the vitality and cohesiveness of a given field of inquiry, because they implicate the ability and competence of its practitioners. Such questions are applicable as much to high- as to low-consensus fields that offer advanced degrees. Answers to the questions identify a major means by which program faculties can strengthen graduate education and thereby produce a more consistent, coherent, and collectively productive professoriate.

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