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Doctoral education in the USA

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Introduction

Since the mid-1990s the USA has annually awarded about 40,000 doctorates (42,155 were awarded in 2004). This is currently the largest number of Ph.D.s produced by a single country (medical doctorates and doctorates of jurisprudence are not included in this figure).

In comparison, in 2001 the 25 European Union (EU) states produced 73,000 doctorates in total. That same year the six major Asian countries combined (China, India, Japan, Kyrgyzstan, South Korea and Taiwan) produced 47,489 doctorates – only slightly more than the USA did alone.

In 2004, the greatest number of US doctorates were awarded in the life sciences (8819) followed by the social sciences (6795), education (6635), physical sciences (6049), mathematics and engineering (5776), humanities (5476) and business and other so-called professional fields (2614), such as public health, social work, architecture etc.

The questionnaire

Table 11.1 The questionnaire (figures are from 2003 and 2004)

<i>Question</i>	<i>Number</i>	<i>Comment</i>
I Total number of doctoral students studying	837,640 masters and doctoral students combined (graduate students) were enrolled in doctoral granting institutions	In the USA it is difficult to disaggregate doctoral enrolment from master's level enrolment, because students may change degree goals during their studies. Even within the same programme, students may be admitted to either a masters/ Ph.D. track or immediately to the Ph.D. degree track <i>(Continued overleaf)</i>

Table 11.1 (Continued)

<i>Question</i>	<i>Number</i>	<i>Comment</i>
2 Number of institutions offering doctoral programmes	419	
3 Number of different doctoral awards	24	US doctoral degrees can be grouped into two types. The majority of doctoral degrees are Ph.D.s (the doctor of philosophy). The remainder includes 23 professional research doctorates such as the DFA (doctor of fine arts) or the EdD (doctor of education). The doctor of jurisprudence (JD) and the medical doctorate (MD) are not considered professional research doctorates
4 Number of years over which doctorates have been offered in the US	Since the late nineteenth century	In 1861 the first US doctoral degree was granted at Yale University
5 Proportion of full-time to part-time students	More students are enrolled on a full-time basis than part-time	At the major research universities, two-thirds of doctoral students are full-time and a third are part-time. At other doctoral granting institutions, slightly more graduate students are part-time than full-time students. In general, more masters students than doctoral students study part-time than full-time
6 Average time to completion	Median time to degree: 8 years	The time is measured from entrance to graduate school until doctoral degree completion – thus masters degrees and time spent on hiatus or withdrawn are included. Completion times vary widely by fields of study, being about 5–7 years on average in the natural sciences and engineering, and 6–10 years in the social sciences and humanities

7 Success rates	Around 60%	Completion rates vary widely by fields of study: engineering and the natural sciences have the highest completion rates; humanities and the arts have the lowest.
8 Typical age range of doctoral candidates	Median age at completion of degree: 33.3 years; average range is 31.7–43.1 years	Age at completion of degree varies by field of study. Engineers and scientists are generally the youngest; education doctorates are often the oldest.
9 Proportion of male/female students	61% of graduate students (enrolled masters and doctoral students) are women; 39% are men. 45% of Ph.D. recipients were women; 55% were men	Women received 45% of all doctorates in 2004
10 Proportion of doctoral students who are nationals of other countries	14%	

Data sources

The data overview comes from various sources. Enrolment data are collected annually by the CGS/GRE Survey of Graduate Enrolment.¹ Data about degrees offered and the number of doctoral granting institutions come from the annual Survey of Earned Doctorates, sponsored by six US governmental associations.²

The place of doctoral study in the national context

Scientific research and doctoral studies are closely intertwined in the USA. Since the beginning of US doctoral education – the founding of Johns Hopkins University in 1876 is often regarded as the establishment of doctoral education – scientific research and graduate education became linked organizationally in the graduate school. While there is research and development undertaken in private industry, basic research is largely undertaken

within the major universities supplemented by large federal and philanthropic sponsorships of the research. The doctorate-granting universities are the only place where scholars who undertake scientific research are educated and trained.

Over 400 institutions currently award doctoral degrees, and the number is steadily increasing. In 2004 there were 419 such universities that produced on average 1001 doctorates. However, a relatively small number of these universities award a relatively large number of doctorates. About 50 per cent of all US doctoral degrees are awarded by 49 universities. This indicates that doctoral education is primarily concentrated in a few institutions – the major research universities – of which the majority are members of the American Association of Universities.

Issues of funding

The USA has both public and private universities. Public universities fall under the sovereignty of the 50 US states. Private institutions are funded by endowments, philanthropy, investments and property holdings, and student fees. A student who is studying for a doctorate at a private institution, once accepted, however, is funded very similarly to a student in a public university. Funding for doctoral education in both public and private institutions comes from various sources: instruction and student advising is funded by the state; research is largely funded by entities within the US federal government (see Note 2) through research grants and contracts to individual professors and campuses as well as by private foundations and contracts with corporations.

Doctoral students are funded through fellowships from the US government, private foundations and individual university sources, or through research and teaching assistantships. Teaching assistantships are typically 50 per cent (part-time) appointments provided by the state for study at public institutions. Research assistantships are generally funded by professors' individual research grants or through traineeships funded from governmental grants. Nearly all natural science, engineering and many social science students work 50 per cent (part-time) as research assistants, and their assistantships are often related to their dissertation research. In addition, most universities grant financial support by waiving fees and tuition. There are also federal and private student loan programmes.

Kinds of institution

As indicated earlier, an increasing number of US universities award doctoral degrees. Each new doctoral degree programme needs to be approved by the university's state higher education board.

By using the most widely accepted higher education classifications created by the Carnegie Foundation for the Advancement of Teaching, doctoral-

granting universities can be classified into two main types of institution: research-extensive and research-intensive.

- research-extensive universities award 50 or more doctoral degrees per year across at least 15 disciplines;
- research-intensive universities offer few doctoral programmes and award fewer doctoral degrees, at least 10 doctoral degrees per year across three or more disciplines, or at least 20 doctoral degrees per year overall.

As a way to coordinate their various graduate programmes, US universities early on established the concept of a 'graduate school', a central administrative unit that oversees all masters degree study, doctoral education and post-doctoral training on a campus. As a result, US universities are called 'vertical universities', consisting of a first tier – the undergraduate college – that is largely committed to general education; and a second tier – graduate education – that provides specialized education and training where doctoral students join their professors in the laboratories and seminars. A graduate dean oversees this second tier to ensure that those policies and procedures that govern the quality of the graduate education (including, for example, admission of students and dissertation requirements) are adhered to. In order to be effective, the graduate dean belongs to the inner circle of the university president.

The roles and functions of the graduate school are manifold. It monitors student progress, grants degrees, collects dissertations and approves new degree programmes. It increasingly raises money from philanthropic sources for doctoral student fellowships and establishes procedures for financial support. It is an advocate for the intellectual development of students, and supports faculty and academic staff in their roles as advisers. In its monitoring function, the graduate school focuses on access and equity, student retention and progress, time-to-degree, career development and doctoral educational outcomes.

Forms of doctoral study

There are two basic types of doctoral degrees awarded in the USA: the doctor of philosophy, the Ph.D., which is the research doctorate, and the professional research doctorate. Currently there exist 23 professional research doctorates, such as the Doctor of Engineering (DEng), the Doctor of Fine Arts (DFA) and the Doctor of Education (EdD). The Doctor of Jurisprudence (JD) and the Medical Doctorate (MD) are not considered professional research doctorates. The majority of doctoral degrees are Ph.D.s as this is the major research doctorate and the general requirement for becoming a professor. Professional doctorates most often lead to employment in the field outside the university. There are usually fewer research methodology courses (such as advanced statistics courses) required, internships are often included in the study course and the dissertation is more applied in nature.

Students and their programmes of study

Admission to doctoral study is extremely competitive, as with the admission also comes a commitment by the programme to financially support the student. Admission criteria are generally based on the student's undergraduate grade point average; their scores on a three-part national graduate entrance examination consisting of a verbal, analytical and quantitative component; three letters of recommendation from undergraduate professors; and a 'Statement of Purpose' essay.

While there are many variations, a doctoral study programme generally involves (1) coursework, (2) a series of exams, often called the general exam or qualifying exam, (3) a dissertation proposal, (4) an original piece of research (the dissertation) and (5) the public defence of the dissertation research.

Depending on the field of study, the coursework, for example, may last three years and consist mainly of seminars. The general exam serves to demonstrate the knowledge of the field acquired during these coursework years, and may often be demonstrated in a publishable piece of work.

At present the average time-to-degree in the natural sciences and engineering ranges between five and seven years. The range is generally longer, six to ten years, for social sciences and the humanities. This time is calculated from the time of entrance in graduate school until exit with a doctoral degree. This time most often includes time spent in masters study *en route* to the doctoral degree. The differential timing is partly due to the better funding available for natural science and engineering students, and partly due to a more structured process in a laboratory environment.

Most Ph.D. students are full-time, although they generally also work 20 hours per week either as research or as teaching assistants throughout their doctoral study period. Science and engineering students usually work as paid research assistants, doing research on work related to their dissertation. Social science and humanities students work far more often as teaching assistants, and rarely have the opportunity to be paid to work on their dissertation.

Part-time students can be found mainly among professional doctoral degree students such as in education, social work or public health fields.

The number of women receiving US doctorates has steadily increased since the Second World War. During the last ten years the proportion of doctorates awarded to women exceeded 40 per cent. In 2004, nearly half of all doctoral degrees awarded (45.4 per cent) were awarded to women.

Currently, 20 per cent of all US citizens who earn doctorates belong to racial/ethnic minority groups.

Supervision

Each doctoral student has one chosen main adviser as well as a dissertation committee of five professors. Two of these committee professors are required to come from outside the doctoral programme. In general, US doctoral students have a fairly close relationship to their main dissertation adviser. In recent years much attention has been paid to the faculty/student relationship and mentoring has become the preferred model. A mentor, in contrast to an adviser, nurtures, protects, guides and socializes the student into a professional of their field. A faculty mentor plays an active role in the student's job search after degree completion. In short, faculty often take on a role beyond simply advising on programme requirements and dissertation guidance.

Examination

As described earlier, a typical doctoral student passes a number of examinations both oral and written in nature. At most universities the doctoral student has a five-professor examination committee that includes one graduate school representative. This representative's duty is to ensure that the examination proceeds in a fair manner and that graduate school policies are followed. The written dissertation is required to be approved by at least three committee members and is most often 'defended' publicly.

Statistical information

Doctoral education statistics are fairly rich due to the long established data collection surveys by the National Science Foundation. A summary report of the national Survey of Earned Doctorates is published annually by the National Opinion Research Center of the University of Chicago. This survey is administered at the time a doctoral student submits their dissertation to the graduate school. This survey is funded by six federal agencies (see Note 2). In recent years, the National Endowment for the Humanities funding from the US government has been drastically reduced, thus their contribution to funding humanities doctorates appears to be in jeopardy.

Critical comments

As universities have come under scrutiny and are asked to demonstrate accountability for their resources, doctoral education has been criticized on several fronts: its long time-to-degree in some fields, its assumed dropout rate and its lack of data on doctoral completion and doctoral placement information. Spearheaded by the Council of Graduate Schools, the professional

association of graduate deans, an effort to collect comprehensive doctoral completion data is currently under way.

However, there is still little national effort to collect Ph.D. placement data and retrospective doctoral programme evaluations in a more systematic way. The Center for Innovation and Research in Graduate Education (CIRGE) at the University of Washington has become a national centre dedicated to collecting Ph.D. career path information, as well as aggregating doctoral programme quality assessments from doctoral recipients. CIRGE has completed three national career path studies to date: the *PhDs – Ten Years Later* study (biochemistry, computer science, electrical engineering, English, mathematics and political science), *Art History PhDs – A Decade Later* and *Social Science PhDs – 5 Years Out* (anthropology, communication studies, geography, history, political science and sociology). The surveys included about 65 US universities and had a response rate between 50 and 70 per cent. They were funded mainly by private foundations such as the Andrew Mellon Foundation, the Getty Foundation, the Ford Foundation and the National Science Foundation.³

Conclusions

As US doctoral education continues to grow and evolve, it will become more imperative to track, study and understand the programmes' effectiveness – including the educational outcomes of the Ph.D. US doctoral education will continue to need to respond to external market forces, including meeting demands for interdisciplinary-trained scholars who can solve large societal problems, and do so while working in teams and across national boundaries. It will also need to reconcile internal forces that impede change, such as disciplinary and departmental budgeting and faculty promotions, as it strives to be innovative and relevant to societal needs and contribute to knowledge creation. Given the trend of reduced governmental funding for higher education, US doctoral programmes need to become even more creative in financially supporting their doctoral students.

Notes

- 1 Administered annually by the Council of Graduate Schools, the professional association of Graduate Deans.
- 2 The National Science Foundation (NSF), the two National Institutes of Health (NIH), the Department of Energy (DOE), United States Department of Agriculture (USDA) and National Aeronautic and Space Administration (NASA).
- 3 See CIRGE website, www.cirge.washington.edu.