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Make the most of PhDs

The number of people with science doctorates is rapidly increasing, but there are not enough academic jobs for them all. Graduate programmes should be reformed to meet students' needs.

It is hard to argue against the idea that a workforce should be highly educated. The media, politicians and universities all believe that a scientific background will not only benefit individuals, but also drive science, innovation and the economy. As a result, the number of people entering higher education in the sciences and engineering has been on the rise for decades. Between 1995 and 2012, the Organisation for Economic Co-operation and Development reported an overall increase in university graduation rates of 22 percentage points. In the same time frame, the PhD production rate has doubled, even though PhDs account for only a small percentage of higher-education graduations.

Getting a science PhD can be a very fulfilling experience, in which students spend a few years enjoying the rigour and freedom of academic research. Many pursue a PhD because they love the science, to satisfy their curiosity about the world or to contribute to a growing body of knowledge. All hope to emerge with the skills to pursue career goals, within or outside academia.

They have a good chance of doing so, too. Science PhD holders experience very low unemployment rates — just 2.1% of people with doctorates in science, engineering or health in the United States were unemployed in 2013, according to the National Science Foundation (NSF) Survey of Doctorate Recipients. The overall national unemployment rate for people aged 25 or older was 6.3%.

But the chances of getting a faculty job in academia — the career dream of many — are slim. Of the employed doctorate holders in the NSF survey, just over 50% were working outside academia across a variety of sectors, including industry, federal government and non-profit organizations. Many young researchers feel that their graduate training does not adequately prepare them for these different careers. Nor do they feel that they are being properly informed of their future prospects or the realities of the training. Many principal investigators, universities, funding bodies and governments are keen to keep pushing the message that a science PhD is good, and that there are plenty of jobs in academia. Job markets are not fixed, and can change substantially between the start and end of a lengthy PhD.

The opportunity cost of a PhD can also be substantial for young people. Not all have the luxury of being able to spend several years on a PhD with low pay and no clear destination — they can't afford it, might miss out on other opportunities, or prefer to pursue deep training in another sphere that is more appropriate for their skills and chosen careers.

If we accept that there are positives to having lots of PhD holders, then we need to work out how the system should change to support them all. As a News Feature on page 22 explores, various suggestions are bouncing around. One is to revamp the PhD so that it combines research with development of workplace skills. Several institutions, such as the University of California, San Francisco, run courses that offer graduate students training in management, communication and entrepreneurship.

Students could also skip the PhD entirely. Many who are contemplating a doctorate but aren't sure of its value to their future could instead experience postgraduate research through a master's degree.

A more controversial idea — around since the 1970s — is to cut the total number of graduate students entering the system. This has met with stiff resistance from faculty members, university funding bodies and governments.

The biggest problem for early-career researchers seems to be a lack of data on the career trajectories and opportunities available to them. Although some information-gathering efforts exist, none is substantial enough to provide the detail needed for students to make informed decisions about their futures.

To create a happy, sustainable PhD population, collaborative efforts between students, academics, industry and government leaders are needed. A science PhD is no longer an apprenticeship in science for academia, but an apprenticeship in scientific thinking that is beneficial for all walks of life. There are already some grass-roots campaigns in this direction, but they are not enough. The welfare and future of the economy and science rest on the shoulders of young, highly educated workers. Policymakers need to start putting the graduates' needs first. ■

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Root causes

Research has a part to play in identifying the factors that breed terrorism.

How can research best contribute to understanding and fighting terrorism, and to improving counterterrorism policies? A common focus is a narrow concept of radicalization that explores why individuals turn to extremism.

Since the 11 September terrorist attacks in the United States in 2001 — and the deadly bombings in Madrid in 2004 and London in 2005 — an entire industry of government-funded consultants and researchers has grown up around this idea. But many researchers find such emphasis problematic; they argue, for example, that it can distract from the need for a broader understanding of the roots of terrorism. They also fear that counterterrorism policies based on it may be ineffective, and risk being counterproductive.

Research to understand why and how people, such as the young people who carried out the attacks in Paris on 13 November, become