



ANNEXURE 14

Postgraduate Supervision and Mentorship: Lessons from the classroom

Briefing paper prepared for the second national
Higher Education Transformation Summit, 2015

Tshilidzi Marwala¹

Abstract

This paper focuses on the identification of factors that are necessary for the successful supervision of postgraduate students. It is based on lessons that I have drawn from the classroom as a supervisor of 19 doctoral and 46 master graduates of whom 31 were black South Africans. In particular, the paper deals with how to transform the South African academy especially in relation to bringing more black South Africans into the mainstream of academic life.

¹ Professor Marwala is the Deputy Vice Chancellor (Research, Innovation, Post Graduate Studies & the Library), University of Johannesburg. umarwala@uj.ac.za

Introduction

Much has been written about South Africa as a developmental state. What is often overlooked is the fact that for South Africa to be a dynamic developmental state, appropriately qualified human capacity is a critical requirement. What is this developmental state and what does it intend to achieve? The goal of our developmental agenda is to attain a society where the greatest number of people are intellectually, socially, economically and politically empowered. In order to achieve this goal we require that the greatest number of people is educated at all levels.

This paper, which is an extension of a contribution published in the *Mail and Guardian* (Marwala 2015), concentrates on lessons drawn from my experience as a supervisor of 19 doctoral and 46 master 'students, to identify key strategies that may assist in expanding postgraduate training. The postgraduate students that I have supervised came from diverse backgrounds in terms of religion, nationality, gender and academic backgrounds.

Why is it important that South Africa educates its people at the postgraduate levels? It has been found that there is a relationship between the number of masters and doctoral graduates and the number of innovation products as measured by the number of patents and industrial designs. Now the question that lingers in people's minds is whether the fact that the number of innovation products is correlated to the number of postgraduates implies that there is a causal link between the number of postgraduates and innovation products. After all there is an ancient dictum that states that "correlation does not necessarily imply causation". On discerning causation from correlation on this particular matter, however, it is found that there is in fact a causal link between the number of postgraduates and innovation products. Innovation products are an important component of industrialization. For example, when an organization develops a plant to manufacture products, for instance cell phones, the manufacturing line needs to be designed to meet local needs and this often entails innovation. So in summary postgraduate training is a critical component of our industrialization strategy.

Identification of Potential Students

Given that postgraduate training is a necessary condition for innovation and industrialization, it is important to explore how one can design mechanisms which increase and capacitate postgraduates. First, it is necessary to identify potential postgraduate students early when they are still at undergraduate levels and employ them as research assistants so that they experience what a research career is all about. In order to achieve this one needs to undertake good research, which is up to date, and is introduced to undergraduate students, often as supplementary reading.

Having a dynamic laboratory with state of art equipment which students can explore and learn from is also important. In order to build this environment, resources are necessary and therefore when an academic applies for grants he/she should put undergraduate student assistantship as part of the grant.

Furthermore, it is important that the students in the group are diverse especially in terms of race and gender distribution. I have often found that once one attracts a black South African student into a research group and supervises him or her well, there is an avalanche of black South African students entering postgraduate studies. It often helps that even at the leadership levels, there is diversity, and I have found that creating visiting positions in the research group and attracting black South Africans as Visiting

Lectures or Professors often serves as an attractor of black South African students. I have benefitted greatly from appointing doctoral graduates, who are based at Science Councils such as the Council for Scientific and Industrial Research (CSIR) and industries such as Eskom, as visiting academics.

Once students are appointed as student research assistants they should be engaged and required to participate in research activities such as postgraduate seminars and be involved in all aspects of research work, even if it is on a small scale like taking readings in a research experiment or making sure that a paper to be published is referenced in a style required by the relevant journal. These undergraduate student assistants should be introduced to the research community by sending them to conferences even if these are local conferences.

Creating an Environment for Successful Supervision

One very important factor of postgraduate supervision is to create an environment that encourages innovation, creativity, intellectual development and success. What differentiates world class universities from ordinary universities is the environment for student training. For example, the average completion rate for postgraduate training in South Africa is lower than that for countries such as the UK, China and USA. Furthermore, the period of completion of postgraduate training is generally longer in South Africa than in the UK, China and Japan.

The great weakness in our postgraduate training is the limited level of the postgraduate ecosystem, which is measured by the number of students working in one area. In this regard, it is often the case in theoretical sciences that if one reveals an idea, researchers in the advanced North are able to research it faster because of their relatively larger postgraduate ecosystem. The South African Research Chair Initiative (SARChI) of the Department of Science and Technology (DST) managed by the National Research Foundation (NRF) is specifically intended to create an ecosystem that has a large number of students, postdoctoral fellows and senior researchers working in the same area.

This ecosystem is not going to be effective unless it is diverse in terms of nationality, race, gender, academic backgrounds and religion. Consequently, a SARChI chair which is not diverse is limited in terms of scope of innovation, creativity and success. This diversity opens the students' minds and promotes innovation. It capacitates the students to see the world with multi-dimensional lenses and thus empowers students with skills to confront problems with diverse strategies to maximize the attainment of workable solutions.

How does a supervisor build such a diverse group of students? First, it is important to be open to new ideas and be willing to recruit students not only domestically but also internationally. Second, the supervisor must be willing to collaborate with other researchers, especially internationally. Third, supervisors should transcend disciplinary boundaries to create a multi-disciplinary team. For example, it is often beneficial to have a sociologist within a team of engineering students. Of course, certain disciplines such as artificial intelligence, which involve computer science, psychology and biological sciences, are better aligned to building multi-disciplinary teams than others such as mathematics.

Postgraduate supervision should not end with the students graduating but should extend well into the graduates' research careers. I have often found that it is beneficial to let some of my master's graduates pursue doctoral qualifications elsewhere in the world as they act as good ambassadors and build international networks for our research enterprise. In this regard, some of the students I supervised, and who were incidentally black South Africans, went on to complete their doctoral qualifications in universities such as Oxford, Cambridge, Harvard, Purdue, Rutgers, Concordia and British Columbia.

Financial implications

Building research student teams requires financial resources because the team not only needs to be paid stipends, but also requires well equipped laboratories, running costs and conference attendance support. Excellent research students are attracted not only by the academic capacity of supervisors but also by the financial resources required to make postgraduate studies successful. Science Councils such as the NRF and the Council for Scientific and Industrial Research (CSIR) have research grant funds that are accessible to academics, provided that they are in line with the developmental agenda of South Africa. Furthermore, it is also important for academics to access grants in the private sector and internationally. Accessing private sector grants requires that the research that is being conducted is in line with the objectives of companies. In this regard academics must spend time in industry trying to understand what industry requires and use this information to apply for grants that will be used to support postgraduate students and research projects.

It is also important to offer the students international experience: this can be achieved by encouraging and enabling them to participate in international conferences. International conference participation is best done after students have conducted a substantial body of work that can be presented. This is because it is generally fruitless to send postgraduate students to international conferences if they do not have papers that they are presenting. Another mechanism for giving students international experience is to put them on exchange programmes whereby an overseas student comes to a laboratory in a South African university and the local students go to overseas laboratories. I have found that this is best done if there are ongoing collaborative relationships between academics from different countries. The NRF has bilateral agreements with sister institutions overseas to promote the mobility of students and staff.

Conducting research that matters is a good mechanism for attracting excellent students. For example, problems that define our times such as big data, the internet of things, climate change, inequality or poverty seem to attract students. Documents such as the Millennium Development Goals and the World Economic Forum report are good reference sources on what problems define our times. One can even use technologies such as topic identification software to identify problems that are attracting attention and thus have the potential to mobilize resources. This should be treated with caution, however, because we cannot know in advance which research actually matters in the future.

What is to be done?

In line with the old dictum that says that “the aim of revolutionaries is not merely to understand the world but to change it” and in answering the call of what is to be done, I propose a few ideas to take this conversation forward.

Industry, academia and government collaboration is not only desirable but a necessity. For example, of the more than 200 SARChI Chairs awarded by the DST, there is no comparative investment in these research chairs from the private sector. Therefore, we need to identify industry partnerships for these chairs so that we can expand them in terms of their number and the depth of their activities. The NRF proposal scheme includes provision for research assistantships. However, this is not enough, and therefore other Science Councils should come to the fore to capacitate this important component of postgraduate training.

It has been my observation that black academics are better able to attract black postgraduate students and therefore initiatives such as the SARChI Chairs, which are overwhelmingly occupied by white academics,

should make provision for deputy Chairs who could address the racial demographic dilemma of this initiative.

The Department of Higher Education and Training recently introduced the nGAP initiative which is intended to broaden and transform the academic establishment. Again this should be leveraged with industrial players to expand their number, for example by encouraging an nGAP Chemistry Lecturer to be jointly supported by a Chemical Company.

We need to introduce joint appointments with Science Councils and industries of academic staff.

Finally, we need to introduce the concept of visiting academics as a national project to allow movement of academics from industry to academia and vice versa as well as movement of academics from and into South Africa.

Reference:

T. Marwala, Postgrad study key to development. *Mail & Guardian*, September 4 to 10 2015, p 35.