

CHAPTER EIGHT

Preparation of the next generation of research leaders

In the transformation of the higher education system in South Africa it has become clear that the full mobilisation of the talent pool of the nation is both the biggest challenge of and the biggest opportunity for taking the country to new heights of national development and competitiveness (ASSAF, 2009:67). In the context of this study, part of that talent pool is the cohort of new young scientists and scholars. Mentoring in doctoral education is crucial to students' development as professional researchers. As with the term leadership, there is no single definition of mentoring in scholarship of graduate education, but there is some agreement that mentorship must contribute to a student's professional socialisation (Hall and Burns, 2009). The concept of research capacity has been widely used in the South African higher education research context and "there has been recognition of the need for 'research capacity building'" (Dison, 2004:84). The merger of higher education institutions has posed challenges for research capacity development. Within the South African context, "research capacity building' has most commonly been framed by discussions of research development of black and female students (individual level) or historically black universities (institutional level). It has been less commonly associated with development of novice white staff and students. This research sees research capacity development as an issue concerning all researchers. "The complex and wide ranging nature of research capacity means that development of capacity is a long- term, multifaceted ad multilayered process" (Dison, 2004:85).

In the context of mentorship as a potential strategy for the development of leadership, this chapter focuses on the different influences of research leadership in developing and driving the high-quality research performance of emerging researchers. This includes the participants' own views as well as the personal experiences of students of their research leadership. Mentoring occurs in the conceptual framework of a relationship and as such is

multidimensional; at its best it is also caring and transformational (Ackerman et al., 2002).

The mentees who responded to the questionnaire represent different disciplines, including the humanities, engineering and biological sciences. Tables 13 to 15 below provides a summary of the disciplines represented in order to illustrate their diversity and relate this to some of the more salient features of post-graduate education in South Africa. The participant leaders have supervised many postgraduate students (over 40 in the case of some). Thus the sample is not representative of all the students they have mentored in their careers. Nevertheless, the subsets of each group of mentees provide sufficient information to establish a mentee/student profile in relation to the findings.

Table 13: Summary profile of mentee respondents of one research leader in the Humanities

Research Discipline	HUMANITIES			
Mentee Respondents	A	B	C	D
Race/gender/citizenship	Black Female(1) Malawi	Black Female(1) South Africa	White Female(1) South Africa	Black Male (1) Lesotho
Current position	Dean of Faculty in Malawi	Full Professor and Executive Dean (another university)	Associate Professor	Senior Lecturer and Director of Institute in Lesotho

This information shows a diversity of students supervised, with more female than male students and more black than white students. Half of the students were from African countries outside South Africa, and all foreign students had returned to positions in their home countries. All had completed their Master's degrees under the supervision of the research leader, and, they all occupied academic positions in higher education institutions at the time of the research. Generally speaking, these details support the findings of a study on the profiles of PhD students conducted by ASSAF (2010), viz. that women are particularly well-represented among doctoral graduates in the social sciences

and that there has been an increase in the number of non-South African doctoral graduates from South African institutions (p47). South Africa is an important regional player and the leading host country for international students in Africa. The international students are mainly from countries in the Southern African Development Community (SADC) and the rest of Africa (more than 60%), with relatively smaller numbers from Europe (15%) and North America (Rouhani, 2007).

The next summaries represents mentees from the fields of engineering and natural sciences.

Table 14.1: Summary profile of mentee respondents of one research leader in Engineering

Research Discipline	ENGINEERING			
Mentee Respondents	A	B	C	D
Race/gender/ Citizenship	White Female (1) German	Black Female (1) South African	Black Male (2) South African Zambian	White Male (1) South African
Current position	Research and Development Manager (HEI)	Senior Lecturer (HEI)	Senior Process Engineers (Corporate)	Co-director – Centre of Excellence (HEI)

This table illustrates that there is a diversity of students in this field as well, but that there are more males than females, as well as more black students. The researchers in this field reported that many of the black students come from other African countries to study at this particular historically white university. Internationalisation that promotes maximum institutional impact as part of an integrated experience, should be part of the critical transformation

agenda of the South African higher education system, curriculum and services. Students in engineering usually find employment both in and out of the higher education sector, as illustrated by corporate profiles. The majority of the students in this group studied under the research leader at Master's level, although one student had joined the doctoral team from another South African institution.

Table 14.2: Summary profile of mentee respondents of one research leader in the Biological Science

Research Discipline	BIOLOGICAL SCIENCES	
Mentee Respondents	A	B
Race/gender/ Citizenship	White Female (3) All South African	White Male (1) South African
Current position	1. Phd Student 2. Postdoctoral Research Fellow 3. Senior Lecturer (HEI)	Senior Lecturer Centre of Excellence (HEI)

This group of mentee respondents appears to be more homogenous than those discussed above, although the overall postgraduate student population at the institution consists of a large multinational group in which over 30 languages are spoken. A small percentage of this overall student group are black South Africans. All the mentee respondents have worked with the research leader in their undergraduate studies and have stayed in higher education and in the research institute through doctoral studies and to follow post-doctoral programmes or to take on senior staff positions in the research team. This finding corresponds with the results of the study on PhD profiles mentioned above which showed that about three in five students plan to take up academic and/or research positions after the completion of their doctoral studies, mostly in higher education institutions or as postdoctoral fellows (ASSAF, 2010 p.87).

However, it is also noticeable that a number of the respondent mentees have been employed after graduation, by their departments or centres. Cross Mhlanga and Ojo (2009) describe this as a problem of incestuous academic production and reproduction in South African universities. These have operated largely as closed systems where graduates of the same institution replace their own professors with very little space left for the recruitment of outsiders. It is felt that this practice tends to curtail intellectual cross-fertilisation and sound academic practice. In the Cross et al. research study on internationalisation at a South Africa university, a head of school speaks out on this topic saying:

. . . We tend to be intellectually incestuous. And there are obvious conditions and reasons for that. It has certain advantages but the disadvantages are quite large. What we do is we reproduce all forms of conceptions of the intellectual . . . The idea of being able to get into another institution to see how people are doing it elsewhere is very important for us.

The summaries of mentee profiles above from different disciplines provide an overview of student populations with regard to race and gender, as well as current positions. An outline of the research context in Chapter 2 discusses the transformative agenda of the post 1994 university system with race and gender imbalances in student and staff profiles a key area of attention. None of the research questions asked during the first interviews specifically interrogated this aspect of the research leadership domain, but the challenges of driving transformation became more apparent in discussions about students, through-put rates and the ongoing tensions between equity and excellence. Within the broader research system, research leaders identified challenges that have been grouped as:

a) Quality of basic school education

Given the standard of the schooling system, even the training background at undergraduate level, standards have gone down, especially the ability to write scientific research papers and reports continues to deteriorate. Their English writing and scientific writing skills are very poor. We are trying to get them to build the research mind. (Black research leader)

The policies that either directly request or allude to increasing the numbers of black (SA government definition applies) students in post-graduate research positions are problematic. Few of the students that meet these criteria choose science careers and those who do are ill prepared at high school. It's unfair to expect universities to rectify secondary school shortcomings. (Black research leader)

The comments of these research leaders are supported by recent benchmark studies that show that among South African first-year university students, only 47% were proficient in English and only 7% proficient in the mathematical skills required for first-year mathematics. According to the ASSAF study (2010), “the poor quality of university entrants will continue to contribute towards high dropout rates (40-50% for first year students) and low graduation rates, especially among black students” (p.96).

A participant felt particularly strongly about these impacts on his/her home institution that is one of the traditional research universities in the sample. The comments appear to indicate a level of dissatisfaction with the changes taking place especially with regard to increasing (poor) student admissions.

We want to be in the top 100, but you have to take in more students, work with less money, change your admission criteria etc. The mission of the university becomes incompatible with the policies of the university and it feels like a road to nowhere. Then they express bewilderment and ask why has (name of institution) gone down in the international ratings. (White research leader)

b) Ensuring diverse research student populations

The quantitative data of Chapter 2 reveal that the transformation of race and gender numbers has been slow at PhD level, a fact acknowledged by the research leaders interviewed. Diversity challenges are acknowledged by statements such as ‘we are doing very poorly in that area’ and ‘black postgraduate numbers are not what they should be’. However, there seems to be little consensus about the solution. Black South African students are seen as a ‘prized possession’ in the research context, as highlighted by the statement that... “At our university the competition for the few black students at honours level in the sciences is intense across the different departments”.

The ability of South African universities to attract increasing numbers of research students from other African countries has also posed dilemmas from a funding perspective (some bursaries are for South African students only) and from a research leadership perspective in some disciplines.

In South Africa, for example, we are finding it almost impossible to get South African students interested in the PhD programme of our field. However, we get lots of applications from candidates from other African countries and from Europe. This is a problem that is going to catch up with South Africa eventually where there will be a problem of replacement and continuity in local universities. (Black research leader)

One solution seems to be to draw students from outside the immediate campus. And yet the student selection process used for Master's and doctoral students is one that seems to discourage entry of 'outside candidates'. In most cases research leaders express a preference for PhD students who have studied at least a Master's degree with them. One professor said that most of her students have been with her from undergraduate years and she prefers this approach. Professors in the Engineering field start most of their PhD students at Master's level and prefer them to continue from there - "it is a waste for us and the student if they stop at that stage (Master's), although some (many females) do". A professor from the life sciences explained that he had made an explicit, although unpopular rule for student selection in his institution:

I want no Master's students from outside (name of his institution). I prefer to see them through a Master's programme, see their theses and get a better sense of their PhD potential. We do make exceptions to this rule in some cases where we are able to provide opportunities.

These internal 'grow your own timber' practices are said to increase chances of student success at doctoral level since the continuous track in one institution ensures the robustness of the undergraduate knowledge base. However, internal selection also limits the pool and diversity of potential students, and, in addition to stringent selection criteria, means that students from lesser research-intensive universities will find it difficult to be admitted to the more prestigious research universities. In the South African context this

still remains a particular challenge for achieving race and gender diversity across institutions.

c) Competitiveness and transformation

The tensions between the institutional practices of student selection and increasing diversity of student populations seems to be carried through to the ongoing equity/excellence debate in the South African research context. This is expressed by researchers quoted below and links to many of the preceding factors raised, such as the quality of pre-tertiary education.

There is a single standard concerning excellence in research. This is a global standard. Quality is still a key factor. The disparity of the educational background of students coming into Master's and doctoral programmes is enormous. And some people need more time, they really need more time. And if you do not give them more time they will come out with less and this affects the reputation of the academic programme and/or institutions.

Nurturing and mentorship is imperative. But this takes time and it is time that our competitors internationally do not have to spend. With an uneven playing field internationally, it is, and will continue to be, difficult to compete at the forefront.

Given these contextual transformation challenges for students and early researchers, it is no wonder that the mobilisation of the talent pool is considered both as the biggest challenge and the biggest opportunity. Increasing the diversity and number of doctoral students is imperative if South Africa is to become globally competitive. Individual research leaders, institutions and funding agencies have to remain committed to working together on a range of specific interventions to provide the necessary nurturing and mentoring still required in the system.

This generalised portrait of the mentee population and some of the salient transformation challenges to the context of doctoral education provides a background for the rest of the chapter that addresses the role of research leadership in:

- Attracting new researchers and scholars;
- Mentoring and supervision;
- Driving enhanced research productivity;
- Cutting the umbilical cord – creating new research identities.

8.1. Attracting new researchers and scholars

In order to mobilise the existing talent pool in higher education and improve the number of doctoral graduates in the country, there must be ongoing efforts to attract students to the research profession. At a national level, the recommendations of the study on PhD profiles recognise this fact and suggest building on early research awareness before students enter university, and then offering stronger incentives in early post-graduate programmes for students to continue studies towards Master's and doctoral qualifications (ASSAF, 2010:17). In trying to understand what motivated mentees in this study to enter doctoral studies for the question asked was:

Why did you choose to follow a research career through PhD studies?

The most frequent response to this question was that the PhD was viewed as a requirement in academia. There seems to be a very clear understanding among the mentee group that if you are to enter academia, then the PhD is the initial licence to practice. The goal is more than just the PhD for the qualification. As stated by one of the professors: "It is not so much the research itself: it's more like an apprenticeship, learning how to take an open-ended problem and mould it and grow it and work with it with a level of continuity". The mentee responses illustrate a level of curiosity in research and scholarly activities that is often stoked and intellectually challenged by a positive Master's experience. The large majority of mentees in this sample see the PhD as the foundation for a career path towards becoming a well-established and competent scientist. This relates to the early analysis that showed that the greatest proportion of the mentee sample was made up of those who had chosen to remain in the higher education sector. This is a positive perspective, especially considering that only about 40% to 50% of the

academic staff at South Africa's research-intensive universities have doctorate qualifications.

In some cases mentees were also staff members at the universities and the PhD as a requirement translated into pressure to graduate "...there is great pressure at my University (where I have worked for the past twenty years) to get a PhD and to do research". In some cases the PhD requirement was positive motivation as illustrated by one of the mentees who was a staff member at the time:

I was also motivated and needed to get the PhD as soon as possible since I was already employed by a university and knew that without a PhD I would not be promoted. I was also on three years' probation, which increased the pressure! Of course attending my students' graduation ceremonies and joining the procession in a black gown with many people wearing red gowns was also something I dreaded!

In other cases there seems to be a warning to be careful where some young members of staff are 'pushed' to do a PhD for promotion purposes rather than because of passion, interest or intrinsic motivation. It seems as if the doctoral experience in this case was one of frustration because of a possible lack of support at the institutional level.

The approach taken by my then Head of School to 'encourage' me to embark on a PhD I felt was entirely unsupportive and counter-productive. I was told that I would lose my job if I did not do a PhD. My lecturing load and clinical supervision load were excessive, with the result that it was difficult to find any time to focus on research. I believe that I would have been able to publish more successfully if my university had given me more time and space to work on writing. When it was pointed out by my HOD that I had an excessive workload and really had no time to fit in a PhD, she did not provide any support. As a result, I spent most of my research period feeling resentful towards the university structures, and did not feel particularly motivated to complete the PhD - other than to prove to myself that I could do it.

In this diverse disciplinary sample of mentees, there are also those whose PhD aspirations were also located in more practical applications for seeking solutions for problems that impact on life. These were sometimes technological (industry related) clinical or community oriented in nature. This was illustrated by the mentees as follows:

My research had reached a point of showing real promise for developing some of the tools we had worked on in the Master's, and with the encouragement of my supervisors, I saw a potential to be part of creating something innovative that could be a real contribution to the area of science.

Most of it I would say was personal motivation and the need to strive for excellence as an individual. More importantly was the drive to provide solutions (in this case anticancer and anti-HIV drugs) to help our society curb the scourges. This is underscored by the need to find ways of research paying back to the society

The findings discussed above are in line with the ASSAF study on PhD profiles (2010) where it was found that in South Africa there appears to be three prevalent understandings of the purpose of the PhD (p.41):

1. as training for an academic career;
2. as training for industry;
3. as training for a profession.

From the range of responses to the question of why it is necessary to have a PhD, it seems that when the starting point is an academic and intellectual interest in the subject matter, then the PhD is also connected to self advancement and enrichment, to a sense of achievement, and to being committed to extending oneself optimally in a chosen profession and scope of practice. This then impacts positively on early career research orientation and research performance.

A second question in the questionnaire sought to investigate whether the attraction to the field or the PhD studies was in any way linked to the particular research leadership or mentor. In this case the question was:

How did you come to study under/work with Professor (name of mentor/supervisor inserted) during your PhD studies?

The preference for internal student selection as discussed earlier in this chapter means that many of the mentees had encountered the professors at various course levels before embarking on PhD studies. Based on these

earlier encounters, the decision to move on to doctoral studies with the identified professors seems to have been a natural progression in most cases as illustrated below:

Prof taught certain courses to me in my Masters degree. I trusted and respected her and so asked her to supervise my Masters' research report. After that I asked her to supervise my PhD. (Frankie's mentee).

In some cases, the choice of supervisor was influenced by the limited availability of appropriately qualified supervisors in the field of choice. This illustrates the point raised earlier where the output of skilled doctoral students in higher education in South Africa is seriously hampered by the lack of enough suitably qualified senior experts in the various fields. This point was made numerous times in interviews with the research leaders and exemplified by the words of Professor Wayne.

We are very few on the ground, two supervisors essentially. Each of us has about 15 (Master's and PhD) students to supervise, with students at times off campus in their home countries.

The supervision then falls on the small cohort of researchers who have PhDs and productive research records. The student's comments illustrate this point.

Prof was the only person qualified to supervise PhD students in our department (Sandy's student). At the time he was the only member of staff in the department with expertise in natural resources and environmental economics, an area I specialised in at PhD level (Agri's student).

A large number of the mentees indicated their choice of supervisor had been based on the research reputation and track record of the professor. Since this is a study of research leadership, a number of quotations will be used to illustrate how important this factor was to the mentor–mentee relationship and to a successful doctoral experience. The students recognise the expert nature of the supervisor/mentor through research records and are aware of the NRF ratings of the researchers. There is recognition that the beginning of the mentee-mentor relationship is often one of “awe in the presence of greatness”

(researcher's own italics) and students often express feelings of honour to be selected or invited to these prestigious programmes. Over time, when successful, this awe-inspired relationship seems to mature into one of mutual respect between mentee and mentor.

As she is one of the foremost experts in the world, on the area I was studying, let alone in Johannesburg, she was really a natural choice for supervisor. (Sandy's mentee)

I completed my fourth year laboratory project under her mentorship, and this was a positive experience for me. When I was invited to join the research group to continue the work begun in my undergraduate lab project as a Master's student I was excited, and to be honest, quite honoured to be chosen to receive such an invitation. (Liu's mentee)

Prof was a researcher with a demonstrated track record and what started as a very respectful and (to be honest) awe inspired interaction grew to be a friendship and trusting relationship that allowed us to explore radical research concepts knowing that no idea was ever scoffed at and that we genuinely respected each others occasionally very different approaches to solving research challenges. (Liu's mentee)

I responded to an advert for a post-doctoral fellowship to work with her. I applied because she is well known and has a good reputation in her field and a chance to work with her is an honour. (Frankie's mentee)

When I returned to begin postgraduate work, she was the first and only person I approached to act as my supervisor. She and I had worked well together on the previous project and I knew she was someone with an extremely good reputation in research and academia. I also felt confident that I would be in good hands. (Sandy's mentee)

With some students, consideration of this expertise base extended beyond the individual research leader, and took into account the reputation of the research facility and the available research infrastructure. In at least two cases students mentioned that the NRF-rating (especially A-rating) was an important factor.

This decision was also based on the fact that the research done at the institute, under the directorship of Professor Bloom, is of the highest quality and recognised on an international level. The institute has excellent research facilities and also houses the largest number of experts who have skills and knowledge that would be valuable in my own research. (Bloom's mentee)

A good NRF rating is important. A good H-factor indicating that the research leader is publishing regularly and consistently and is thus up-to-date with the latest research trends. The research leader must be internationally renowned and respected. (Bloom's mentee)

The mentees' comments about expertise and reputation are often linked to feelings of respect and positive aspects of the broader mentee-mentor relationships. The combination of the academic expertise and the interpersonal relationship skills of the research leaders seem to enable a productive research environment. This importance of the personal dimension of leadership is supported by the work of Bolden et..al (2008) who found that two key personal leadership components included :

- The need for academic or professional credibility; and
- Consultation and openness.

I regarded her as an expert in the area of study I wanted to pursue. I had worked with her in my Master's and liked her style. Of course I also liked the fact that we get along - this is important because if the relationship disintegrates then it can be difficult to complete. (Frankie's student)

I think it is very difficult to be mentored by someone who you do not respect. I also believe that if you respect someone's work and the fact that they are an expert in that specific field of study it inspires you to work hard in order not to disappoint them. (Wayne's student)

Image of a scholar

The relationship between a student and supervisor or mentor is likely to be one of the most formative contexts in which the student's development of research capacity takes place (Dison, 2004). On examining the responses of the mentees to the question of choice of supervisor as well as to questions of experience of mentoring relationships with the supervisor, the findings indicate that these research leaders fulfil an important role in providing the much needed 'image of a scholar'. This image of the scholar also serves to attract and retain younger vibrant researchers in the system. It would seem that having role models who, at the time of mentoring and supervision, are recognised experts in their disciplines is a real advantage to the mentees. This is because they provide an image of what being a scholar is like, demonstrate what they have done, and because they take the time to show

mentees the way. These aspects seem to be significant in their subsequent development path as researchers.

Also the demeanour of Prof in leading by example, and the manner in which he provided guidance throughout my PhD studies, is an inspirational form of leadership to strive towards in my own engagement with individuals who turn to me for mentorship. Prof had (and continues to be) a huge inspiration for me. His supervision of my PhD was a turning point in my research development (Wayne's mentee)

I learned on the job and of course Prof was a good role model and mentor. Through her own work she motivated me to work towards excellence. She never demanded to have her name on all the papers I wrote. All the papers that have both our names were really co-authored (Frankie's mentee)

She is a multidisciplinary researcher who is able to introduce students to new theories and concepts in the field or to theory from other fields. She is an excellent networker who makes the most of every opportunity to network and interact with researchers in and out of her field. Ultimately, I think she is someone who believes in the power of research, is passionate about research and strives to conduct novel and excellent research. (Sandy's mentee)

In summary, attracting and retaining a young, productive research cadre seems to be influenced by the students' own early interest in research and the quality of the research experience before embarking on doctoral studies. Those seeking to undertake a doctoral degree value a recognised expert and world leader as their supervisor and mentor. These research leaders provide the cutting edge research experience, but also act as positive research role models by providing an image of a productive scholar. This experience of working with researchers at the top of their profession seems to stimulate a long-term impact on research development and productivity as seen from the developing research trajectories of the mentees in the study.

8.2. Mentoring and supervision

Among most research leaders interviewed, the feeling was that staying connected to teaching is important to them as professionals. However, it is also clear that the teaching/research balance is still a challenge and, as

discussed previously, some career moves have happened because of what were considered unreasonable workloads (read teaching loads). Having fewer hours in teaching reflects the reality of highly productive researchers committing more time to research compared with others. Once again, even in teaching, emphasis is on the established researcher as the role model, providing the image of the scholar in efforts to attract undergraduate students to postgraduate studies. This is a role that should assume more importance, given the lack of adequate research training at the undergraduate, honours and Master's levels in the South African context.

I also believe that the best researchers should be teaching 1st years - this draws people into the field and inspires them and actually has a long term gain. (Professor Sandy)

So I try to talk to them already from undergraduate level - tell them what it means to do research, how amazing it is. But also that being a researcher is not an easy job and sometimes the rewards of the job take very long to arrive. It is not an instant gratification type of career. (Professor Marie).

8.2.1. Mentoring Models

It is evident that the research leaders in the sample use different approaches to training and development for research. At least 50% of the research leaders in the sample use the traditional apprenticeship model with a limited number of students per research leader. This is characterised by the one-on-one mentoring relationship between student and supervisor. This traditional model of supervision is still the most prevalent approach to doctoral education in South Africa. In this sample of researchers the model can be found to exist across disciplinary boundaries.

I feel one must keep a reasonable size of people. I prefer 6-8 students which I can then manage effectively with my teaching load. Here I disagree with (name of institution). They want you to have as many students as possible, mainly because of financial benefits. More people may sometimes mean increased output, but the question of how to manage these effectively and the benefit of the growth of each remains a challenge. (Professor Marie)

A smaller group of research leaders (about 20%) used a cohort or course-based model that brings together groups of students for specified cycles. The move towards cohort-based programmes satisfies the need to achieve a critical mass of students and to create an academic environment (ASSAF, 2010:93). An example of this type of programme is that in which Professor Agri is involved:

So we designed a regional Master's programme where people get placed at their own universities (about 18 participating universities from Africa) for the Master degree and then come here to our Centre for 4 months to be taught specialisation courses we have designed. They then go back to their home countries and complete programmes at and get degrees from their home universities.

An even smaller number of research leaders used the large-team or committee approach to student mentoring and supervision, with a professor admitting that his own positive experience of doctoral studies in the USA had influenced his decision not to use the single advisor-student type of relationship. The committee approach is thought to provide a strong mentorship chain and seems to work well for those few faculties that have adopted this method. The views of researchers using this approach are outlined below:

Pretty much all students working in the group have a committee of two or three and even occasionally, four, advisors. The committees are diversely structured and give the student access to more than one brain, more than one way of thinking and thus the security of a group of people. It also gives early career researchers an opportunity to learn to supervise in conjunction with the more experienced researchers in the team. (Professor Bloom)

Professor Liu believes that her team approach certainly works for scholarly development. She explains it as follows:

Students are put into research groups and then we meet with every research group every week to talk about their research. I think students sitting in and listening to other students is helpful since all the research projects are somewhat related. The other thing is the results they are getting, especially that the more senior members of the team who are near to PhD are listening to the younger ones – getting feedback every week. When one of the students is stuck, the others in the group can ask questions, encourage,

motivate etc. You are not on your own. So I think they learn quite quickly in the group and realise that some weeks or months will be tough with results not coming, things going wrong and a few dead ends. But you see other people in the group pull through that phase and the whole group can get excited on behalf of another student who they know has battled through. This is confidence building towards publication.

The outline above shows that this sample of established research leaders used different approaches to doctoral supervision. This ranged from the traditional apprenticeship model, more evident in the social sciences and humanities and with researchers doing fundamental research, to larger cohort-based programmes in inter-institutional collaborations across a number of countries. A limited number of research leaders in this sample worked with large research teams and used the research group or committee approach for doctoral supervision. However, regardless of the model of supervision used, there was a strong emphasis on providing a rigorous, quality academic experience as a solid base for the next generation of researchers.

8.2.2. Mentorship as leadership development

Part of the doctoral mentorship process is to provide opportunities for mentees to gain experience in the leadership role while still being part of a supportive environment. According to mentee responses, none of them were provided with formal leadership training through institutional human resources or management courses. However, they did acknowledge that they were initiated into supervisory or leadership roles through their graduate experiences and were given a fundamental perspective of the professoriate. This practice would be in line with holistic capacity development where "learning to be a researcher involves more than acquiring the necessary knowledge to do research, the competence to perform procedures, and an understanding of the disciplinary material. A novice would need to become competent in all these abilities in an integrated way through acquiring the identity of a competent researcher in the communities of practice in which she/he is working" (Dison, 2004: 88). It is acknowledged that there is no such

thing as an ideal mentor or mentee – or even an ideal mentoring programme. However, the experiences listed below from responses of mentees to the question “What kind of training and preparation did you receive for any future leadership roles?” provide insight into what should be included in mentor programmes

8.2.3.1. International experiences

Postgraduate education increasingly includes preparation to be able to function in international contexts. The supervisor can provide a link to research communities by virtue of being an established member of a disciplinary community or communities. Some of the research leaders included international exchanges and study visits as part of the doctoral experience. This was an expensive undertaking for the research groups, but the research leaders who supported this as part of the doctoral training considered it to be an essential part of the research experience. Mentee feedback indicated that such opportunities were seen as highly-prized rewards that encouraged mentees to work very hard and enhanced the research experience and morale.

One of the things we try to do with all our PhD students is send them overseas for 3-6 months to work with one of the top research groups in their area. It is a great experience when they go overseas and work with these top teams and discover that they are as good as the best in the world. They come back and they are actually quite different people. (Professor Liu).

8.2.3.2. Committee Work

As part of large research institutions or research teams, mentees reported having served a number of roles that contributed to overall management experiences. These early responsibilities seem to have provided experience in the development of administration and people skills, all essential for the complex role of academic leadership.

Being head of the Post-graduate Student Association and student representative on the MANCOM committee was helpful. I have also been

involved in setting up and running our own mentoring program at our institute for the last several years. This would include interviewing appropriate students for the positions and training mentors. (Bloom's mentee)

8.2.3.3. Working with undergraduate students

In academia, the opportunity to tutor or mentor undergraduate students is one of the preparatory forms of leadership training. Most mentees reported this type of early research development.

I have also been involved for the past 2 years in clinical supervision of undergraduate student practical's, which has given me valuable skills in terms of evaluating and critiquing students work, as well as in dealing with tricky student issues such as unprofessional behaviour. (Sandy's mentee)

8.2.3.4. Joint research responsibilities

From mentee responses it seems that all the research leaders had been careful to give mentees opportunities that strengthened their development both as a researchers and as supervisors - e.g. joint writing of papers, joint supervision of both undergraduate and postgraduate students (with seniors taking a stronger supervision role and mentees watching and learning), observing research meetings between supervisors and other students, travelling with leaders to local and international conferences and presenting papers. In many cases mentees were also involved in the preparation of funding proposals.

8.2.3.5. Building networks

From Chapter 7 it is clear that extensive national and international networks are one of the hallmarks of research leadership. Research does not do well in isolation. Consequently, part of the role of the leader is to promote the development of the mentee network as early as possible in the research career. Conference attendance does promote network building, but it is interesting to note additional means of forging confidence in the network.

During visits of international guests we are asked to chaperone them - show them around and help with anything they need help with. In doing so we get to know people from all over the world and start building networks. (Bloom's mentee)

This type of experiences builds the social dimension of leadership which includes both formal and informal networks and relationships within and beyond the institution (Bolden et al, 2008)

8.2.3.6. Leadership by example

Mentee responses indicated that leadership training is also possible through the personal example of a credible research leader. Here the mentoring is less overt and formal, but seemingly equally powerful in impact on future leadership behaviour.

Prof's mentoring was not about helping me in the lab. This I was capable of doing myself and teaching myself. The mentoring came in the subtle ways of how he treated people, the way he communicated, what he communicated and the general way he managed the institute. In this regard I have thus learnt a lot about how to motivate people to help them achieve the best of their potential. I have also learnt how to conduct myself professionally and how important it is to make and maintain international collaborations. (Bloom's mentee)

From the discussions above it is evident that the mentees in this study emphasised the advantages of having opportunities for "learning on the job". For this reason it is essential that mentees are introduced into these early research leadership roles as part of their professional socialisation into academia.

8.3. Driving enhanced research performance

As recorded earlier, this group of research leaders form part of what would be considered the established research community. Most government support programmes for this community (e.g. The South African Research Chairs Initiative and Centres of Excellence) have been intentionally designed to

support researchers in their endeavours to increase research and innovation outputs as well as strengthen human capital development in the form of new generations of researchers. According to the research records discussed for the research chair professors (many of them from this sample of leaders) supervise, on average, more students and publish more papers than other research scientists. Based on the research output of the rated researchers (taken by NRF rating) in this sample, it became important to understand what they were doing to drive this level of research performance in their units.

Firstly, what stood out during discussions with the researchers and from the feedback of the mentees was that the research leaders were *research-centred*. This central focus on research can be seen by the high level of commitment to the research goals and a research vision that was clearly articulated by leaders and mentees alike. The leaders were passionate about research and as quoted earlier, in some cases the research had become the focus of their lives. Love of their work was mentioned in almost all discussions.

Research is the main focus, then other things. We work on a very strong team approach. My job is make sure it all works – that the research environment is right – that they will get their PhD's.

The love of my work is a key factor. It is also the relevance of what I am doing and the fact that I am developing people, meeting wonderful people and engaging others. I have a superb research team this year, two post docs, collaborations and work that is internationally recognised. This has been my best year productivity wise.

The research-centeredness was carried through to the creation of enabling research environments and research cultures, as illustrated by mentee feedback about the impact the mentoring of their research leaders had had on their research capacity and professional growth. Comments included the following:

*Encouraged independent thinking and a questioning attitude....
Provided space to be creative, to test ideas without feeling judged....
Encouraged wider reading and writing beyond the narrow focus of the PhD topic....*

Encouraged weekly meetings where she provided a platform for free discussions and criticism.....

Secondly, there is an overwhelming emphasis on developing the quality of scientific writing and on getting mentees to *publish* their research. Research leaders seem to use various means to improve levels of publication. Some research leaders only support conference attendance based on demonstrated progress toward publication. The emphasis is on increasing the quality of research output. One research unit has developed an incentive programme to encourage research performance and is giving special recognition for student publications in high prestigious journals. Mentees in this programme reported that the financial incentive had worked very well and that this had made students more critical of their own work and had encouraged them to think about where they would like to publish. According to the research leader of this unit... “We are saying we are doing great, but let see if we can do better. So it is about pushing the bar, but you have to work hard at it all the time”. Mentees seemed to understand this emphasis and were guided by this philosophy. Evidence of this attitude is to be found in the feedback below:

Prof has very high academic standards and expectations, and chapters are usually ready to be published at the end of the thesis, if not already published. His criteria for reviewing and developing a thesis are thus the same as would be for a peer reviewed journal.

Thirdly, there is a strong focus on *excellence*, on producing the highest quality science. This was discussed in detail in Chapter 7, but is worth repeating here since it is repeated in the mentoring relationships. One of the mentees described her professor in the following way:

She demands high-quality work. She is driven by outputs and expects her students to be reasonably intellectually independent.

Fourthly, mentees reported that adequate *financial assistance* was an important contributor to research performance. This factor is supported by the finding that “the most salient feature of a productive doctoral programme in South Africa is the level and diversity of funding” (ASSAF, 2010:92). In many

disciplines in South Africa, people coming in to doctoral programmes are older and have families to support. This creates enormous social pressures, and as Professor Liu, who has a team of up to 40 research students explains:

We do a lot of budgeting with students, since we believe that if they cannot cope financially, if they cannot feed themselves, then they cannot do research. So we have to attend to that type of support as well.

Where high-performance research leaders of the stature of this group are able to draw in substantial government, industry or donor funding for projects, then the students' circumstances are improved considerably:

We receive good bursaries – this means that we can concentrate on our studies and do not have to worry about generating extra income to survive.

Lastly, some research leaders have been shown to put together *innovative doctoral programmes* that are sometimes reproduced by colleagues in other parts of the university. Types of innovative schemes discussed in this study include specific ways of supervising students through multi-level committees, international research experiences during doctoral studies, students working on consulting assignments in foreign countries and financial incentives for quality publishing.

The findings suggest that the established research leaders are able to provide an environment that is conducive to enhanced research performance. This influence is based on their own intellectual research leadership and scholarship that ensures that they lead by example and hence can make demands for research excellence from their research teams. They are also able to provide adequate resources to facilitate research development and performance.

8.4. Cutting the umbilical cord: creating new research identities

The separation phase is a recognised phase in the mentoring relationship. It is described as “a phase in which the protégé begins to experience a new

sense of independence and autonomy. Furthermore, the mentor must be able to let go, to encourage power and independence” (Ackerman et al. 2002:1144). Dison’s study of research capacity development of individuals within three research units in South African higher education institutions argued that “there is a reciprocal relationship between the growth of the mentee’s internal strength, confidence and ownership of the meaning-making and the processes of exposure to and feedback from the disciplinary community “(p.95). Professor Marie offered the view that ... “South Africa still puts a lot of value on the PhD. As one who has a PhD, you are given so much respect, are already viewed as a leader just because you have a PhD. However, this is dangerous, since lots of time people who have a PhD have not proved themselves as yet apart from their supervisor”. This comment agrees with a commonly-held criticism that usually arises with large, successful research teams headed by publicly acclaimed research leaders. Given the dynamics of the research leaders and their sometimes equally-productive research mentees in this sample, this is a criticism that did not escape some of the research groups as evidenced by the comments below:

The other level is that it is often perceived from the outside that academics in our particular research group are not doing independent research but merely following the research vision of our leader. This is, however, not true as all of us also have our own research interests and we try to develop these more strongly. (Blooms’ student)

This comment ties in with what Professor Marie, and others, say about the challenges of some doctoral students to develop an identity that is separate from that of their supervisors. In some cases, mentees reported that continued research collaboration with the supervisor had affected their rating applications with the NRF. As a mentee explained....

If one was to read the reviews I received for my rating application, it could be said that I have not succeeded in making the separation from my supervisor. (Lius’ student)

In larger research teams, efforts to develop new research identities are sometimes not easy and may, in the short term, be rather stressful and have to be carefully managed. A mentee's experience follows:

My separation from the group was an unpleasant experience - there was some politics involved with the then head of school which led to some misunderstandings between all of us. However, in hindsight this has been the best thing that could have happened as it allowed me to create my own research area and I have not once regretted this. (Liu's student).

I think it was something about the students themselves - that they were able to grow and make their way, establish themselves separately. And it was not easy here. They were seen as my 'students' even post PhD. They also had their struggles. (Name of mentee) dealt with all kinds of things. For some she was too black and too angry. For others she was in my pocket and that was the only reason she was making progress. So they had to get pass all that stuff. Now they are making their own difference as independent, very senior academics (Research leader)

However, 'cutting of the umbilical cord' as part of establishing a new and separate identity seems to have been experienced by most mentees as a positive phase. There is recognition that it can be a gradual process of letting go but that it was a necessary process that was generally encouraged by the mentors, as illustrated by the mentee comments collected below:

My mentor always encouraged me to develop new skills, take up new initiatives, and be creative.

Prof agreed that it was important for me to do move on...

Prof often emphasised that I need to focus on my new career and was highly supportive.

These comments align with the concept of 'positioning voices' found in Dison's study where researchers mentioned the profound effect of affirming, constructive voices in building their confidence as academics and as researchers. The post PhD careers of the sample followed divergent pathways and mentees felt that they had achieved their individual and, in some cases, still emerging identities via various channels. In general, mentee responses indicate that this separation was initiated and/or achieved by:

Joining a new research group

This was a gradual process and at first the relationship was maintained. We still communicate and maintain a collaborative project together but having my own research and research group has enabled me to develop along my own path. (Maries' mentee)

By the end of my PhD I realised that I would like to take the research into a different direction, namely trying to commercialise some of the ideas that led to a cutting of the umbilical cord I guess. However she supported me all the way by using her networks and her status to realise meetings and funds (Liu's mentee)

Access to funding

Getting an NRF Thuthuka grant immediately after my PhD graduation was the greatest freedom from my mentor as supervisor. Suddenly I had an opportunity to make my own decisions about what goes on in my research, who to collaborate with etc. While I still continued to interact with Prof as my mentor, I made the decisions, owned the project and included her only when I felt necessary. I made contacts with other researchers in my field and developed relationships with them that were separate from Prof. In about two years of graduating I was beginning to introduce Prof to other researchers in our field that she did not even know. She allowed me to be the expert (Franki's mentee)

Independent publishing

I was provided with leeway to publish aspects of my research independently without my supervisor insisting on being a co-author. This has presented me as an expert on my own right. My research leader also created opportunities for me to make public presentations without insisting on sitting-in or taking credit for my work.

This letting go phase is critical to the professional development of the protégé. The doctoral experience is not distinctly separate from the eventual community of practice. The emergence of healthy, independent research identities in the new young cadre of researchers is a reminder that successful mentoring structures and relationships must allow all participants to grow and thrive both professionally and personally. If the process of mentoring and then cutting the cord is successful, then, in the words of Professor Franki,..... "We have created another chair".

I remember a conversation with one of my students in the very early days in the department and I said to her "where do you want to be in the future?" And

she said “I want to sit in your chair”. Maybe somebody else would have thought that she wanted to usurp me. I didn’t feel that way. That’s where she was going and that was fantastic. Now I don’t have to get out of the chair in order for her to be there - there is another chair.

8.5. Concluding remarks

In summary, the findings suggest that confident, intellectually strong, internationally renowned research leaders who lead with passion and compassion are able to motivate and mentor emerging researchers using a variety of supervision programmes. They encourage enhanced research performance through an emphasis on and demand for excellence and then let the mentees move on to take their own place as peers in the established research community. The research leaders in this study favoured a consultative, empowering leadership approach, and in general this view was confirmed by the mentee reports. Mentees seriously considered the research reputation when choosing supervisors and mentors and the actively performing mentors acted as role models by providing close-up images of the scholar. The research shows that mentors provided mentees with early professional socialisation experiences and provided them with management and leadership responsibilities throughout their studies. Most mentees reported that space was created in their mentee-mentor relationship for them to finally move out of the shadow of their research leaders and into a new identity as independent researchers.

Transformation imperatives for student diversity and a new generation of truly diverse South African researchers still however remain a challenge in the context of the overall skills requirements of South Africa.