

Mentoring unemployed science graduates in South Africa: early lessons learnt

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As part of the National Youth Service Volunteers Programme, the Department of Science and Technology implemented the first two-year programme in 2008-2009. Unemployed science graduates were selected to participate. One hundred interns were placed in 22 science centres where they learnt work-related skills while seeking permanent jobs. As all the candidates, aged between 21 and 35, were historically disadvantaged individuals who had graduated from historically black higher education institutions, a mentoring system was implemented to help accelerate their development. This article reports on the experiences of the interns and their mentors and highlights mentoring good practice for such innovative programmes. It also contains some longitudinal data about their employment after the internship ended.

Mentorskap vir werklose gegradeerde wetenskaplikes in Suid-Afrika: vroeë lesse geleer

As deel van die Nasionale Jeugdiens se Vrywilligersprogram het die Departement van Wetenskap en Tegnologie in 2008-2009 die eerste tweejaar-program ingestel. Werklose gegradeerde wetenskapstudente is gekies om deel te neem. Een honderd vrywilligers is in 22 wetenskapsentra geplaas waar hulle werksverwante vaardighede geleer het terwyl hulle op soek was na permanente werksgeleentheid. Aangesien al die kandidate tussen die ouderdomme van 21 en 35 jaar histories-benadeelde individue was en by histories swart hoëronderwysinstellings gestudeer het, is 'n mentorskapprogram ingestel om hul ontwikkeling te versnel. Hierdie artikel doen verslag oor die ervaringe van interns en hul mentors en beklemtoon goeie mentorskappraktyk vir sulke baanbrekersprogramme. Dit bevat ook sekere longitudinale data in verband met hul indiensneming na internskap.

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The National Youth Service Volunteers (NYSV) Programme is a government initiative launched in August 2004 to engage young South Africans in community service activities in order to strengthen service delivery, promote nation-building, foster social cohesion and assist the youth to gain occupational skills necessary to access sustainable livelihood opportunities.

The importance of the NYSV Programme is obvious in that all participating departments had to report to the Office of the President.¹

NYSV operating principles emphasise the following: learning should be part of service; service activities should support sustainable development at community level and in terms of personal development for participating youth; appropriate incentives should support the participation of young people, for example accredited training and support to access sustainable exit opportunities; sites for youth service should be selected on the basis of service delivery priorities; NYSV should develop a culture of self-reliance and community ownership, and effective partnerships should drive the successful implementation of NYSV.

For the Department of Science and Technology (DST), this NYSV Programme was a pilot programme placing 124 unemployed science, engineering and technology (SET) graduates aged between 21 and 35 in various Science Centres to enhance capacity and efficiency in those institutions. The “volunteers” are referred to as interns in this article.

Table 1: Demographics of interns, aged between 21 and 35, from historically black universities, in the 2008 programme

	Africans	Coloureds	Indians	Total
Female	71	5	5	81
Male	38	0	1	39
	109	5	6	120

In addition, there were two white men and two white women in the programme. Table 2 shows the percentage of interns in various SET disciplines.

1 The authors acknowledge the assistance from Ms Jansie Niehaus, Director of the National Science and Technology Forum, for providing relevant and accurate information and a clear perspective on the progress of the programme.

Table 2: The percentages of graduates in SET disciplines

Biology and Biotechnology	19%
Chemistry	25%
Physics	10%
Environmental Studies	28%
Mathematics and Applied Mathematics	18%
Information and Communication Technology	25%
Engineering	19%
Total	100%

As the purpose of the programme was to empower the interns with workplace skills to prepare them to enter the job market or undertake postgraduate studies, a mentoring programme was set up to accelerate skills transfer while building capacity in science centres. The success of the programme would be demonstrated by permanent employment, or pursuit of postgraduate studies. Few studies in South Africa investigate such interventions and the efficacy of mentoring during the process.

The purpose of this article is to report on the role of mentoring in the NYSV two-year pilot programme.

1. Literature review

There appears to be some acknowledgement that mentoring is a valuable process in training scientists at both undergraduate and postgraduate level (Katz 2007). There is a paucity of literature in the sciences on why the process is important. One article from the USA (Wells *et al* 2005) offers mentoring guidelines for wildlife professionals. It provides a general review of mentoring and makes a good case for mentoring. It is theoretical but gives no examples of specific mentoring programmes.

Another article from the USA (Siebert 1999) reports on the effectiveness of formal mentoring for mechanical and electrical engineers at a Fortune 100 company in the photographic equipment industry. Results show that subjects with formal mentors reported significantly higher levels of job satisfaction. However, they did not differ from their non-mentored counterparts in terms of work-role

stress or self-esteem at work. These results suggest that a formal mentoring programme can have positive effects on individual and organisational outcomes, but its effectiveness may not be as extensive as widely assumed.

Downs (2010) reports on a vacation apprenticeship for undergraduate students interested in biological control in various institutions in South Africa. This type of mentoring is used internationally with similar students. Downs (2010: 688) states that there is

a growing concern nationally and at institutional level over the paucity of students pursuing science, particularly Black and female graduates, despite the implementation of a number of measures to address this.

Downs cites Scott *et al* (2007) as stating that the higher education sector has unsatisfactory performance patterns: relatively high first-year attrition, and many students not completing their degrees within the minimum time. There is a call for improving teaching and learning in higher education in South Africa. Downs (2010) notes that while South African initiatives and funding at postgraduate level by the National Research Foundation and the Science Councils encourage an increase in the number of postgraduate students, in particular black and female students (NRF 2008), the landscape remains unchanged with few students in the biological sciences, in particular.

An article documenting the mentoring of unemployed science graduates in a learnership in ecological informatics in South Africa shows that the programme succeeded in making candidates employable, with 90% of the learners working in different science and technology sectors; two Honours degrees were also awarded (Makhado *et al* 2009). Although Makhado *et al* (2009) do not detail how mentoring was done or how often the learners met with mentors, it is clear that mentoring was an integral part of the programme. Mentors were not given specific training in mentoring bioinformatics learners. Workplace mentors play an important developmental role due to their experience of work environments. They traditionally provide both career development and psychosocial functions as described by Kram (1988) and Cohen (1999).

There is little reflection in the literature on the transformative view of mentoring designed to cause change in organisations rather than only at individual levels. The transformative nature of career mentoring cannot be ignored in science where changing policies and practices are politically and socially important (Geber 2004). Transformation is an important new function of mentors, emphasising their function as role models. Black South African mentors in science mentoring perform the additional functions of being change agents and diversity managers, to relate specifically to transforming the equity goals of institutions, as mandated by the government's overall Research and Development Strategy for the science, technology, and engineering sector (RSA 2002). Historically, the majority of SET professionals were white males. Statistics show that many of them are approaching retirement, and should be succeeded by younger scientists to maintain continuity and innovate scientific productivity. Secondly, a productive and well-trained scientific workforce is essential to maintaining a technologically sophisticated, competitive, and growing economy. Given South Africa's history of racial division and gender demographics, it is imperative that government intensifies its efforts to increase the number of blacks and women in scientific professions (RSA 1996).

The transformational mentoring model (Geber 2004) evolved as a result of a study of early career academics at several South African universities. This indigenous African model is important for considering organisational and social transformation. Transformational mentoring involves establishing learning alliances for professional development and a commitment to social and organisational change (Geber 2003). Learning alliances are partnerships between mentors and mentees that enhance growth for both parties.

The following section discusses the programme implementation in 2008.

2. Programme implementation in 2008

There were four major components in the programme implemented by the National Science and Technology Forum (NSTF).²

- Placement

The interns were placed in 22 science centres in all the provinces in January 2008. Participating science centres included Sci-Bono Discovery Centre (Johannesburg), Sci-Enza Discovery Centre (Pretoria), Mondi Science Centre (Mpumalanga), Unizul Science Centre (KZN), and the MTN Science Centre (Western Cape).

- Orientation programme

The official group orientation programme was held in Pretoria in February 2008 to ensure the interns' broad understanding of the NYSV Programme and its intended outcomes.

- The mentoring workshop for interns

The workshop held during the orientation introduced the interns to the concept of formal mentoring, to make the most of the mentoring, and to urge them to draft their personal development plans.

- Mentor and science centre manager mentoring workshop

The workshop was also held during the orientation to introduce the managers to basic mentoring principles and best practices.

3. Information technology, soft skills and driving training programmes

Graduates from historically black universities are typically not exposed to work environments prior to graduation. Consequently, many are unable to deal with interview and selection processes competently. The skills development programme was designed to engage interns in the work of science communication. Presentation skills helped them prepare and deliver information to various audiences including learners needing career guidance. Facilitation skills prepared interns to help educators gain new knowledge and use it optimally in the classroom. The interns also learnt basic project management and event management skills to set up exhibitions, workshops and science shows.

2 Cf <www.nstf.org.za>

Training in life skills prepared them for life beyond the internship. Training in leadership was provided for team leaders, elected by their colleagues at the programme review in June, to liaise with the NSTF. The information technology (IT) skills programme introduced basic Microsoft Office, a job market requirement, and all IT graduates were taught website design, to enhance the marketing of the science centres. As driving increases employability, driving training was provided for 35 interns from families that do not own cars.

4. Mentoring training

The training of participants was based on the transformational model of mentoring (Geber 2006) which involves establishing learning alliances for professional development and a commitment to social and organisational change. Mentoring with the emphasis on transformation is particularly important in mentoring training where mentors guide less experienced colleagues in order to help them achieve requirements for the South African national agenda for educational and organisational change. Transformational mentoring is also appropriate as most interns were the first graduates in their families.

Geber & Nyanjom's (2009) argument for using an indigenous transformational mentoring model in mentor development is that transformation needs to be clearly articulated and carefully integrated in the mentoring agenda. They mention that, if this is not the case, it is likely that the changes which happen during the mentoring process will be limited to personal and some professional development and will not affect the overall transformation of the organisation and its equity goals. Transformational mentoring is indigenous as it resonates with African cultural values. The model evolved from several mentoring programmes in South Africa where the Western models did not embrace the African sense of co-operation, the democratic imperative for proportional representation in decision-making positions, and the urgent drive for transforming society for better economic competitiveness and a better life for all. The literature affirms that the two major functions of mentors are career development and psychosocial support for individual development. The transformational mentoring model summarised in Figure 1,

views role modelling as an overarching function of mentors. Mentors act as agents of change for social and organisational change and mitigate prejudice. The indigenous transformational mentoring model emphasises the holistic, systematic nature of mentoring in educational contexts.

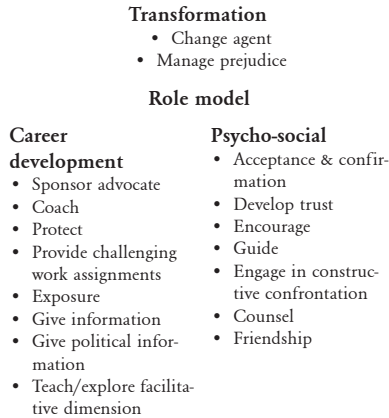


Figure 1: Transformational mentoring model

Source: Geber & Nyanjom (2009)

4.1 Mentor and science centre co-ordinator mentoring workshop

Thirteen representatives of regional science centres attended this workshop held in February 200. The programme was designed to introduce science centre managers and mentors to the concept of mentoring and diversity management for transformational leadership.

4.2 Mentoring workshop for interns

Interns participated as a single group in a workshop held during the orientation in February 2008. This workshop introduced and clarified the concept of mentoring and the benefits of mentoring for them. Using mentoring concepts, they prepared their personal development plans for meetings with mentors and for goal-setting for further development during their internship.

4.3 Personal development and growth planning workshop

In addition to the group workshop, two personal development and growth planning workshops, for groups of approximately 50 interns each, formed part of the initial training. Interns completed a first draft of their personal development plans (PDP) to clarify personal goals for the internship to focus on what they wanted to achieve. Interns explored areas directly linked to the science centre as well as work/life balance, interpersonal skills, communication, assertiveness and dealing with criticism. They were asked to keep their notes to use in their ongoing career planning process and to refer to them again for further reflection.

The PDP development was an initial part of the mentoring process to enable interns to conduct career development conversations with managers and mentors of science centres. The interns were paired with mentors during the following weeks. Further mentor training for new mentors was abandoned due to budgetary constraints within the pilot phase. Without specific and sustained training, mentoring programmes have a high risk of failure and result in disillusionment for all parties (Clutterbuck 2001).

4.4 Monitoring the mentoring programme

There were two formal review workshops in which interns reviewed the programme after sixth months, using a NSTF-designed survey. One finding shows that some managers were not mentoring the interns at all. Managers who had not attended the mentoring workshop did not allow interns to use electronic equipment. They abused interns as cheap labour, instead of grooming them as professionals. This did not

create an environment conducive to the transfer of workplace skills. Team leaders were appointed to form an interns committee to channel information and grievances from each science centre to the NSTF.

Feedback from the review workshop was not systematically relayed to the managers concerned, as the department was unable to fund further aspects of a formal mentoring programme, such as additional formal workshops and training for all managers and mentees, monitoring and evaluation.

5. Methodology

This section sets out the methodology for investigating the efficacy of mentoring during the programme. This is a qualitative interpretative study of mentoring partnerships in the initial two years. Patton (2002) suggests using few, information-rich cases in order to learn a great deal about concerns central to the purpose of the research. Participants were asked to provide information about their partnerships with their mentors and mentees, respectively, and how they experienced the transformational nature of the partnerships. The interns and their mentors gave intensive, rich and in-depth data about the partnerships by responding to e-mail surveys and face-to-face interviews.

5.1 Data collection and analysis

Written surveys and focus groups were used to collect data at different times during the programme. The data were analysed in the process of “making sense of the data” (Merriam 1998: 178) by coding according to the categories suggested by the literature review. The thematic content analysis of all the interviews was conducted according to the constant comparative method described by Maykut & Morehouse (1994). This method allows the researcher to construct categories or themes by “continuous comparison” of items or units of data with each other in order to find recurrent patterns in the data (Merriam 1998). Two main categories of data were uncovered in this process and these are discussed in the following section. In order to check the validity of the categories, three colleagues were asked to peruse the raw data and scrutinise the consistency of the categories that had been constructed.

6. Findings

First, the findings in this study concerning the optimal nurturing of novice science graduates show the complexity of mentoring relationships, where effective mentor and mentee behaviour hinges to a large extent on the ability of the mentor to develop trust as a prerequisite to any successful long-term functioning. Secondly, the findings concerning the best practice activities of mentors show their insight into their own internal dynamics and their awareness of the difficulty of developing others with sensitivity and respect. These mentors are the most effective in developing novice SET graduates in their personal and career development.

6.1 Experiences of interns

According to Girves *et al* (2005), mentors in the novice graduate or early career setting help their mentees set goals and standards and develop the skills necessary to succeed. Mentoring is an intentional process that is supportive, nurturing, and protective, providing orchestrated or structured experiences to facilitate growth. The experiences of interns are grouped by topic below.

6.1.1 Definitions of mentoring

In nearly all cases the science centre manager took on the role of mentor as there were few senior staff members to act as mentors and no funds to pay mentors from outside the science centres. Only 13 of the 22 science centres had sent senior staff for the mentoring training in February 2008. As the benefits of having someone other than the manager or supervisor as the mentor were emphasised in the mentoring workshop, interns often had the impression that science centre managers would not be their mentors; they were thus at a loss as to where to obtain mentoring. Consequently, there was a lack of consensus about the nature of mentoring, and how to mentor the interns. This comment by a volunteer is typical: "I didn't have a mentor but the centre manager somehow acted as one". Confusion about the designated mentor reduced the potential benefits, had science centre managers had more clarity about mentoring and what it entails.

6.1.2 Setting clear goals

Interns experienced varied levels of support from science centre managers and mentors. Some received a great deal of support, had regular meetings, and discussed goals and career options. Mentees set goals and knew what they wanted to achieve at the science centres. Their goals ranged from wanting to develop new skills, including technical skills, and developing programmes for learners and educators visiting the science centres to “soft skills” such as communication, interpersonal skills, and personal growth. Their goals also featured general career planning and work experience; registering for postgraduate or professional studies; networking to secure permanent jobs; buying laptops; learning to drive, and helping younger siblings through school.

One intern who received regular mentoring commented:

The centre manager was very clear as to what was expected of us and guided us through. He saw potential in all of us and exposed us to many different areas so as to gain experience.

This kind of structure and setting of expectations was helpful to interns. Developing a trusting relationship with a mentor built the foundation for setting realistic career goals. The mentor and mentee tracked the mentee’s progress and the mentor gave valuable feedback to the mentees on the issues arising during the programme.

Lack of support for interns in goal-setting had negative effects and hampered their optimal development, as one intern reported:

I could not grow as much as I could have [...] this I feel was due to time constraints and lack of interest from management.

Mentoring must include frequent interaction, clear goal-setting and follow-up during the relationship.

6.1.3 Frequency and quality of the mentoring process

There was a lack of consistency in the amount and quality of the mentoring experienced by the interns in many science centres.

Cohen (1999) recommends frequent meetings and a clear agenda are important for effective mentoring. Some interns reported that they met their mentor weekly or monthly and were satisfied with the mentoring. One intern stated:

Due to the fact that my mentor was only at the Science Centre for two weeks per month and sometimes less, our meetings could not be as frequent. I was however free to contact her whenever I needed to.

The quality of the mentoring encounters was as important as the frequency, as one intern commented:

Everyone needs advice and encouragement. It meant a lot to me to know that someone believed in me and thought my ideas were good.

Building rapport, trust and giving encouragement were key qualities of good mentoring and made it valuable for both parties (Clutterbuck 2001, Geber & Nyanjom 2009). Another intern commented: "My mentor motivated me, that is one of the reasons why I went to the Grundfos Academy".

By contrast, many interns had irregular interaction with mentors. Some had no support at all; thus the experience was not as helpful and could certainly not be called mentoring. An intern who did not receive mentoring commented as follows:

We did not have enough time [with our manager], so career guidance did not happen. We worked as though we did not have qualifications at all! No projects were given to us.

Lack of guidance, goal-setting and support undermined the interns' development and they found it difficult to know what to do and what standards are expected. This caused novice graduates to fail and perform poorly.

6.1.4 The transformational effects of mentoring

As 97% of the interns were historically disadvantaged individuals, the mentoring system was implemented to accelerate their acquisition of relevant skills. Mentoring was aimed specifically at increasing the number of black graduates in the science centres and in the organisations who ultimately employ them. Because transformational mentoring involves establishing learning alliances for professional development and a commitment to social and organisational change (Geber 2003), it is clear that only those interns who received mentoring benefited from the transformational nature of the relationship. One of the interns acknowledged this:

Mentoring played a crucial role and having known that there was someone I could talk to, made my life in the centre easier and worthwhile.

Some interns experienced a transformative shift in thinking about themselves and their career ambitions during mentoring. One intern expressed the transformation as follows:

My mentor taught me that science education is just as important as science itself. That made me decide what to do with my life. I always thought I would become a researcher, but now I'd rather be a science communicator.

Being an educator is often not the first career choice for SET graduates.

6.1.5 Ongoing training and support for skills development

Interns indicated that the ongoing training provided by the NSTF was very useful, improved their skills and made their work easier. Many used their newly acquired skills at the science centres, and gained more confidence in the presentation of science shows and the organising of exhibits and workshops. Some interns designed websites to market the science centres and used their IT skills to work faster and more efficiently.

Some interns were fortunate in receiving additional training which was not part of the pilot phase. These were arranged by science centre managers, the DST, or the NSTF.

- Six interns visited Australia on DST funding to learn more about science communication theory and practice.
- Two interns visited a science centre in Germany for six weeks to conduct research.
- Six mechanical engineering graduates did six months of industry-based training in the Johannesburg academy of a global pump-manufacturing engineering company.
- Two interns visited the CSIR for two months for further training in biotechnology.
- Four interns went on exchange training at other science centres to learn to use specific equipment and to allow for cross-pollination of ideas between science centres.

Additional development opportunities were highly prized by the interns and their experiences showed how young graduates began highly successful careers early. One intern mentioned the following about being exposed to additional experiences:

My centre manager arranged visits to other science centres, which was very helpful in introducing me to the science centre industry in South Africa. I also attended and presented at two South African Association of Science and Technology Centres (SAASTEC) conferences which I would say was the highlight of my time as volunteer.

The value to the interns of being mentored cannot be too greatly emphasised. Being shown how to develop early in one's career has many long-lasting benefits. In addition to making the transition from student to employee and colleague, there is great benefit in finding one's way around a new organisation without being overwhelmed. Dealing with the complexities, the politics and unwritten rules of the work environment makes having a mentor one of the most valuable partnerships in one's career.

6.2 The best practice activities of the mentors

Mentoring of SET graduates is a relatively new research area in South Africa. Mentors evaluated their workshop and were very positive about it. The managers and mentors sampled in this study assisted the researchers in outlining the best practices for mentoring SET graduates in science centres.

6.2.1 Introduction and settling-in process

As part of welcoming and integrating interns into the science centres, some managers and mentors interviewed interns to assess how best they could add value. In one science centre, interviews and role play tested the new interns' telephone etiquette and message-handling skills, both crucial to the science centre's effective communication with its external stakeholders. Other assessments included psychometric testing to ensure fitness for purpose. Written exercises were designed for interns to demonstrate their communication skills, for example writing a letter to the principal of a school to make arrangements for the learners and educators to visit a science centre.

In addition to assisting in the early identification of skills requiring development, the introductory interview process helped managers and mentors identify the interns' strengths and capabilities, their academic majors, previous experience, or personalities.

6.2.2 Clarification of roles

The mentor must clearly define and articulate the roles and responsibilities of the interns. If the manager is also the official mentor, both parties should understand the difference in these relationships and what they entail. If the mentor is another staff member or if mentoring rotates according to the various activities in which the intern is engaged, this must also be clearly understood by all those involved. Clearly identifying roles and responsibilities helps the interns settle in easily as they know whom to turn to for guidance.

6.2.3 Structured meetings for setting targets and deadlines

The managers and mentors must discuss and understand the objectives and anticipated outcomes of the internship as well as the individual expectations of both the mentor and the intern. Clear time frames for the interns' achievement of targets should be set and agreed on. Short reports and feedback sessions must monitor progress systematically, and necessary support must be provided. The work allocated must be sufficient and stimulating. Interns can be assigned useful tasks and real projects that make them feel part of the science centre and make a valuable contribution. They can also be exposed to different business units, such as administration or finance, to give them a broader understanding of the organisation's systems. The work should be sufficiently challenging for them to demonstrate their existing knowledge, while helping them learn and utilise new knowledge. Kram (1988) shows that mentors give mentees challenging work assignments to promote their professional development.

Regular weekly meetings for planning and constructive feedback are useful to ensure the allocation of responsibilities and projects, foster brainstorming, streamline systems and reporting lines, as well as improve performance.

6.2.4 Team-building

It is important that interns feel part of the team as soon as possible. This does not have to involve outdoor games and sundowners, but

it might mean sharing the space where staff members eat or relax. Many lessons that help shape the interns' professional life and broaden their appreciation of cultural and racial diversity are learnt in conversations in the staffroom. These informal interactions also improve proficiency in English and in confidence. Placing interns' photos in the staffroom ensures that others perceive them as integral to the science centre's knowledgeable staff complement.

6.2.5 Assistance in the job-search process

While seeking a permanent job or opportunities for further study was the primary responsibility of each intern, the managers and mentors were responsible to assist them. Managers were encouraged to help the interns get permanent jobs in vacant positions in the science centres, in competition with external candidates. Some mentors assisted only by providing information and advice for planning the interns' career paths clearly or by contacting potential employers in the science sector to introduce interns to possible employment opportunities. Mentors actively helped to expand the interns' professional networks. As a key function of mentors, networking encourages professional development (Sorcinelli & Jung 2007).

The learning of mentors in this pilot programme is valuable to both them and DST in sustaining future internships for unemployed SET graduates and in offering best practice activities which can be implemented throughout these institutions for social and organisational transformation.

7. Challenges and early lessons learnt

The learning alliances yielded important lessons for the managers. Some discovered how ill-equipped they were as mentors, and expressed the need for mentoring training. Others realised how understaffed they had been prior to the interns' arrival.

- Delegating responsibly

The managers mentioned that learning to delegate responsibly was a challenge and trusting that the interns would do the work properly without being micro-managed. Managers let the interns learn from their mistakes and gave them feedback, not only when things went

wrong, but also for their successes. Managers had to exercise patience in the process of transferring skills.

- Making time for administrative duties

Some managers attended a training workshop relating to managing interns organised by the NRF. The administrative work that ensures the success of the internship programme in science centres is considerable. The managers realised that while the presence of interns increased both the number of visitors to the science centres and the productivity of the outreach programmes, they needed to set aside time for extra administrative paperwork.

- Lack of co-ordination between managers and skills-training providers

Managers were not informed of the content of the skills-training workshops and were therefore not able to grant the necessary opportunities for the interns to practise their newly acquired skills, for example using Excel to capture data.

Four major early lessons learnt from the programme are discussed below.

- Consensus about what mentoring entails helps generate consistency in programmes such as the NYSV programme. A common understanding of transformational mentoring, in particular, reduces the likelihood of too much variation in the mentoring of a large cohort of interns in 22 locations.
- Proper funding needs to be secured for the systematic and more effective mentoring training and monitoring of all mentors and mentees.
- Systems need to be in place to facilitate mentoring. The productive use of personal development plans, goal-setting, ongoing training and the deployment of interns on local science centre projects gives interns a sense of meaning and helps them show their capabilities and strengths. It enables them to gain useful experience in science communication, exhibition development and interaction with learners in schools instead of being used as cheap labour. Clutterbuck (2001) interprets the function to “provide challenging assignments” for mentees (Kram 1988) differently. He views the mentor’s role as “stretching” the mentee.

Mentees appreciate being associated with mentors who demand a high standard of work and who indicate when their work needs improvement.

- The preparedness of science centre managers is important. Managers should have been told about the NYSV Programme's expectations for interns early in the programme, not after interns complained about not being appropriately employed in the science centres. Optimal capacity-building occurs when everybody knows what is expected of them. Consequently, those science centre managers with many years of experience provided more opportunities for the interns to grow and develop than those in the newly established science centres set up in 2007.

8. Longitudinal data on permanent placement

The NYSV programme succeeded in providing a developmental space for the interns between their undergraduate studies and permanent employment. Sixty-three per cent of the interns were able to exit the programme by securing permanent employment or pursuing higher degrees prior to the termination of the project. Of these 78 interns, 15 and more were absorbed by the science centres as permanent employees; 11 pursued higher degrees; nine became educators; six became laboratory technicians; nine were absorbed by the ICT sector, and the remainder were given various positions in the SET sector as chemical analysts, trainee engineers, environmental officers, and quality assessors.

At the official close of the first phase of the DST-NYSV Programme in December 2009, 47 of the 124 interns (37%) were still located in the science centres.

Table 3: Interns remaining in the programme in December 2009

	Africans	Coloureds	Indians	White	Total
Female	30	1	2	2	35
Male	11	0	1	0	12

By March 2010, the job searches and career decisions of the remaining 47 interns showed that 22 had full-time jobs, including

five employed as teachers or educators; three were employed as science communicators in the science centres; one was employed as a website developer; two interns were set up in other programmes; eight pursued higher degree studies, and only 25 had yet to be employed.

9. Conclusion

The NYSV programme is an ingenious initiative in the development and capacity-building of novice science graduates. Many of them are historically disadvantaged individuals, with no experience of formal mentoring as undergraduates. The mentoring system was implemented to accelerate their acquisition of new and relevant skills as they planned their career paths and applied for permanent positions in organisations in the science and technology sector. Young black science graduates are highly sought after, but without some experience and concrete application of the theory taught at universities, many of them find it difficult to secure jobs. Using a transformational model of mentoring in this programme provides practical experience and supportive mentoring. Where these are well managed in the science centres, the young graduates gain confidence, work skills and enter the job market effectively. South Africa also benefits from having qualified young scientists in the science centres to make science accessible to school children and the local community. In the long term, this investment should help to change the demographics and completion rates of undergraduate science and technology students enrolled in tertiary institutions.

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