Recommendations

Our recommendations pertain to young scientists that are younger than 40. Only one-third are female, but the proportion of female scientists is the highest among this younger cohort. They are nationals of, and tend to live in, countries in Southern, North and West Africa. Most work in the higher education sector, but to a lesser extent than their older counterparts, and in that sector, almost half hold the rank of lecturer. The qualitative data show that power differentials still exist within the higher education sector. From the perspective of the young scientists (especially those in West Africa), individuals in senior academic ranks (e.g. professors) or in senior management positions (e.g. deans) need to be more approachable, less domineering, and more trusting and encouraging of their younger colleagues’ research aspirations. This is supported by the survey results. Young scientists, in particular, experience challenges in terms of human capacity building and professional development (e.g. mentoring, mobility and training).

The majority of the young scientists are qualified in the natural, health or social sciences, but slightly more than a third are not in possession of a doctoral degree. This probably explains why they work, on average, slightly fewer hours per week than their older counterparts, but are more likely to spend that time on (their own doctoral) research than on training or supervising postgraduate students. However, the qualitative data also show that young (and therefore relatively inexperienced) African scientists simply cannot prioritise their own research if they are overburdened by excessively large teaching loads, especially at the undergraduate level.

There seems to be a lack of recognition, at institutional level, of the extremely time-consuming nature of teaching large, undergraduate classes. An increase in marking and administrative teaching assistance is therefore strongly recommended. In addition, it needs to be recognised that the current institutional strategy of allocating large teaching loads to junior, newly appointed staff, rather than to more research productive, senior members of staff (related to the abovementioned, rank-related power differentials), is an unsustainable one over the long term. Even for those young academics who are already supervising postgraduate students, especially at the master’s level, the potential for such supervision to contribute to their own research is undermined by efficiency considerations, i.e. the sheer numbers of these students researching diverse topics and who are in need of close supervision.

A lack of human resources underlie many of the more specific challenges in the careers of young scientists, and do not only involve addressing high student-to-staff ratios. Another case in point is the young academics occupying positions of responsibility within their departments and faculties. Although they constitute a relatively small group, they are particularly in need of administrative assistance. More effective and efficient university administration systems are needed to release the research potential of this next generation of leaders in the higher education sector.

In general, the ideal that teaching and research functions should supplement each other seems more like a paradox than an ideal. At both individual and institutional level in Africa, we observe tension, contradiction and even conflict between these two core academic functions, which systematically impact more negatively on the research careers of young, relatively inexperienced (and powerless) scientists. A strong emphasis on quantifiable
research outputs is often out of touch with the daily realities with which lecturers and senior lecturers are faced. Although we recognise differentiation and specialisation of both institutions and career-tracks are controversial matters, it may be the only way to substantially address this tension.

Young scientists in particular are further challenged in their careers by a lack of research funding, both when their perceptions and reported funding amounts are compared to those of their older counterparts. In addressing this challenge, our results further show that funding for research equipment (e.g. upgrading of laboratory machines) should be prioritised above, for example, funding for library and information resources. One field that is shown by both the quantitative and qualitative data as being resource-stressed is engineering and applied technologies.

While male respondents (with a few exceptions) reported higher numbers of outputs (irrespective of field and age), gender by itself, as well as in interaction with age and field, do not seem to be highly correlated with reported funding amounts. Rather, age of respondent and field were the strongest predictors of differences in amounts reported.

Inexperience constitutes a major barrier to securing funding, both formally (i.e. funders’ requirements of certain qualifications, levels of experience and international networks are simply not met by young scientists), and informally (e.g. young scientists are relatively inexperienced in writing quality proposals, especially within limited time-frames). Such inexperience is especially restrictive in private research institutes and countries where the scarcity of government funding increases the competition for funding to levels that young scientists – who are still developing their CVs and building partnerships – find very difficult to meet. Those who do attempt to apply for grants, allocate substantial amounts of their time, which could have been used for research, on this task. Those who are unsuccessful, have no option but to use personal financial resources to undertake research-related activities that would further their careers.

Although it is understandable that funders would want to limit the risks associated with funding inexperienced researchers, more differentiated funding mechanisms that take into account level of experience may level the playing field somewhat. For example, seed funding earmarked for emerging researchers would at least allow them to increase their experience, to enter the funding ‘market’, and thereby to address their marginalised position in funding regimes. At the same time, inexperience in fundraising, and specifically writing quality proposals, needs to be addressed through training, mentoring and constructive feedback on unsuccessful proposals. Institutions, mentors and funders could play a strong role in this regard. Recognising that where, and how, to apply for research grants are ‘tacit’ skills young scientists often lack, would be a useful starting point.

In general, and not only in relation to funding, the need for training and mentoring emerges as one that is relatively specific to young scientists, and slightly more so for those in professional fields, such as the health and engineering sciences, than in other fields. Our results further seem to suggest that the transfer of ‘softer skills’ – those that would allow young scientists to, for instance, make informed career-related decisions about job opportunities and establishing networks – is required much more than transfer of ‘harder skills’, such as those involving methods or procedures. It should also be recognised, especially by higher education institutions, that many young scientists may be first-generation academics, for whom the expectations and roles associated with their positions are unclear. Brain drain
compounds the problem, with lacunae being filled by individuals who lack institutional knowledge and support structures.

Inexperience with regard to publishing in journals tends to generate a particularly severe level of stress, even more so than inexperience in teaching, and especially amongst young scientists who work in institutions that lack an established research culture. We found that young scientists (and especially females) produced, on average, a lower number of articles in the preceding three years than their older counterparts did. At the same time, as our qualitative results show, young scientists are aware of the increasing pressure on academics globally, to publish, in order to advance their careers and their position of power in the academic hierarchy.

Many of the recommendations made here would indirectly contribute to an increase in young scientists' journal article output, although unintended consequences of an ill-considered emphasis only on quantity of output and impact factors of journals need to be kept in mind. These include a decline in quality of output, a disincentive to undertake research that is creative and/or has local societal impact, and the temptation to publish in 'predatory' journals.

Suggestions to alleviate the stress young scientists associated with expectations to publish are provided primarily by the qualitative data. Providing guidance in identifying appropriate (and non-predatory) journals for publication was repeatedly highlighted. The supervisor's role is paramount in this regard, as are provision of training and the implementation of checks and balances by institutions, and input from journal editors. As with research proposals, young scientists whose papers are rejected by journals would greatly benefit from more detailed, constructive feedback from editors and/or reviewers. Local journals could provide such a developmental service, and thereby a valuable platform for young scientists who are still learning how to publish. Institutions can play a role by streamlining their research approval systems and ethics approval processes, as well as by providing more adequate research policies and guidelines.

We mentioned earlier that power relations between young scientists and their more senior colleagues tend to be hierarchical, and that competition for funding is fierce. In such a context, it is therefore unsurprising that young scientists often struggle to find suitable mentors, that many potential mentors do not prioritise that role, and that mentors are perceived as 'negative' instead of encouraging. It emerged from especially the qualitative data that formal mentoring programmes, which do not place the onus on the young scientist to initiate a mentor–mentee relationship, are required. In other cases, insufficient numbers of established researchers, often in the more interdisciplinary and emerging fields, mitigate against effective mentoring of new academic staff.

One way for individual young scientists to overcome the challenges they face in their careers in Africa, but especially to develop professionally and to access funding, is to become more internationally mobile. More than a third have travelled in the recent past, and they are more mobile than the oldest generation of scientists. Young scientists are also more inclined to report the advantages of studying and working abroad than their older counterparts are, which provides another perspective on where and how African higher education systems are not meeting their needs. In some cases doctoral and further training is simply unavailable in a young scientist's chosen field. In other cases, there is a general perception that an overseas degree is of higher quality and carries more prestige. This
perception is reinforced by appointment and promotion committees, but is also supported by young scientists’ actual experiences abroad of higher levels of expertise and a greater concentration of experience.

Young mobile scientists rate overseas countries as better than their home country in terms of opportunities for collaboration and funding. Training in the ‘softer skills’, such as writing research funding proposals, which young scientists clearly experience as lacking in their higher education institutions (see above), seems to be more readily available overseas. These observations are supported by our quantitative results that young scientists who are mobile are more likely to secure international funding.

Overseas countries are also rated as more superior in terms of research resources. Lack of research facilities in many African countries impacts negatively on young scientists’ research productivity, limits their skills training, and could also render certain research avenues completely unfeasible. Our qualitative results illustrate the frustration this causes for especially those young scientists who have experienced working overseas with state-of-the-art equipment, well-stocked libraries and even ‘basics’, such as office space, a computer with internet access, a telephone, scanner and printing paper. Not surprising then, is the fact that nearly 80% of all young scientists either often or sometimes consider leaving the country where they work/reside, and three-quarters are of the opinion that a lack of mobility opportunities may have impacted negatively on their careers as academics or scientists.

The young scientists who seem relatively less able to access the benefits that mobility brings, include women scientists, those in public research institutions and higher education institutions (as compared to other sectors), and those working in Southern and North Africa. Lack of mobility seems to be relatively more prevalent among, and is perceived to have the most negative impact on, scientists in the natural sciences, engineering, and applied technologies and agricultural sciences (as compared to those in the social sciences and humanities). In these fields, the lack of access to state-of-the-art equipment and laboratories that we already detailed above is especially debilitating.

Our results support the recommendation that mobility of young scientists should be supported and facilitated. Our qualitative results indicate that young scientists require more information on mobility opportunities and funding for attending international conferences. However, it should also be borne in mind that mobility may have an unintended effect. Many non-mobile young scientists are doubly disadvantaged by the permanent relocation of scientists to countries outside Africa, as the resulting erosion of local expertise creates major challenges for those young scientists who remain behind (which have already been alluded to above). Preventing such permanent brain drain should therefore be a high priority, also because of the ‘brain gain’ that returning researchers offer their African research institutions and countries.

**Concluding comments**

Our study has produced a rich and fine-grained picture of the young scientist and academic in Africa. We have produced findings and evidence that are more comprehensive and up to date than previous studies. By combing multiple methods – bibliometrics, a web survey and