

BEYOND EDUCATION AND TRAINING TO FUNCTIONAL MENTORING: THE CASE OF SCIENTIFIC INNOVATORS IN ZAMBIA

Abstract

The aim of this paper was to argue the case for the need for mentorship of both student and newly qualified scientists in Zambia. Based on both a global perspective, this paper argues that inadequate initial training coupled with inadequate resources make mentorship of newly qualified scientists (hereafter referred to as NQs) a necessity. Further, the paper presents numerous benefits accruing from the mentoring of students and newly qualified scientists. These benefits include benefits to the NQs themselves, and to the nation as a whole. In view of both the identified needs of NQs and the invaluable benefits, the paper ends with a clarion call for the introduction of mentorship of NQs during the education and training process of students as well as mentoring of NQs in Zambian industrial settings.

Keywords

Mentoring, induction, work environment, newly qualified scientists

Introduction

The paper is divided into the following sections: the first section provides a background discussion to the concept of mentorship. Diverse definitions of the concept of mentorship from a global usage are discussed. The problem statement is then stated. This is followed up with a discussion of issues around challenges of scientists and newly qualified scientists, science-based mentoring programmes, as well as the benefits of mentoring newly qualified scientists and prerequisites for formal mentoring. The paper ends with a conclusion and a number of recommendations.

The aim of this paper was to argue the case for the role of mentorship in the education and training of scientists if they are to contribute meaningfully to national development. This paper examines how mentorship can be used to provide a building block for scientific innovations by encouraging secondary schools and technology and vocational institutions to make scientific innovation the centre stage of all science-based learning and activity. In doing so the paper provides a brief overview of mentorship of newly qualified scientists. It looks at a global perspective to the need for mentoring of scientists beginning from the time they are being incubated at secondary school right through to tertiary training. This is in the belief that an environment where young scientists (students) are mentored, leads to the application of the acquired knowledge.

Meaning of mentoring

Different scholars, researchers and authors have offered many definitions and explanations of mentoring over the years. This paper adopts the definition by Mazerolle, Bowman and Klossner (2015: 233) when they state that ‘fundamentally, a mentoring relationship is founded because mentors bring a set of experiences and knowledge beyond what mentees or proteges have, and therefore they can communicate this information to their mentees.’

There has been an explosion of interest in the concept of mentoring in many different professions (Clutterbuck, 1991). In the corporate world, the reasons are perhaps connected with the increasing need for companies to train and develop their own staff in their own way in order to both meet rapidly changing knowledge and practices and to keep their own distinctive identities and contributions in their sector. This paper argues that the scientific community in Zambia needs to borrow from this and develop mentoring programmes as a way of supporting new scientists. This paper focuses on science students and newly qualified scientists.

The problem

The absence in Zambia of mentorship at different levels of the education ladder is well documented Banja (2017). Maughan (2006) has stated that ‘mentoring is an established strategy for learning that has its root in antiquity. Most, if not all, successful scientists and engineers had an effective mentor at some point in their career. In the context of scientists and engineers, mentoring has been undefined. Reports addressing critical concerns regarding the future of science and engineering in the U.S mention the practice of mentoring a priori, leaving organisations without guidance in its application’. Maughan (2007) established that formal mentoring could be effective when properly defined and operationalized. He adds that ‘Recognising the uniqueness of the individual in a symbiotic mentor-protégé relationship significantly influences a protégé’s learning experience which carries repercussions into their career intentions. The mentor-protégé relationship is a key factor in succession planning and preserving and disseminating critical information and tacit knowledge essential to the development of leadership in the science and technological industry.’

Although formal mentoring programmes have been a preferred method of knowledge transfer, training and development, and succession planning, there is an apparent lack of research on formal mentoring programmes, particularly within science and engineering organisations Wanberg, Welsh, and Hazlet, (2003). The scenario described above applies to Zambia hence the knowledge gap that this paper seeks to address.

Challenges of scientific innovation

This section focuses on the review of literature related to the discussion. To understand the concept of NQS mentorship and the needs of novice scientists, a review of the significant professional and popular literature was warranted. This section does just that. This review of the literature is anchored on the Theoretical Framework by Kram’s’ Mentor Role Theory (1985) which suggests that mentoring is a developmental relationship that enhances professional growth and advancement in an individual.

Allotey (2005) states that ‘considerable progress has been made in the field of Science over the past thirty years. ... young scientists in the world especially Africa should be encouraged to attain their full potential, ...in terms of applied science. ...For example, the contemporary needs and opportunities to address Africa’s problems in the areas of health, agriculture and development

are unprecedented. Every effort should be made to equip the young scientists in Africa with all the necessary weapons needed to sustain their interest, productivity and confidence, which will enable them to tackle scientific problems in the environment in which they live and work.’

However, a number of challenges have hindered the proliferation of scientific innovations in Zambia and elsewhere. Top on the list is an educational system that does not seem to support scientific innovations. The needs of NQSs are many and can be traced back to their time during initial training. Lankau and Scandura (2007; 95) have expressed their concern regarding this situation as follows:

Learning from training programmes and books will not be sufficient to keep pace with required competencies for success in today’s fast-paced work environments. Individuals often must look to others to learn new skills and keep up with the demands of their jobs and professions. Mentoring relationships can serve as a forum for such personal learning in organisations.

Promoting scientific innovations entails moving beyond treating science, technology, engineering and maths-related subjects as mere calculations to realising that the study of these fields demands the exploration of deep ideas that result in tangible outputs. In other words, our scientists must be helped to move beyond simply understanding and reproducing scientific facts to manipulating these facts in practical fashion to come up with inventions that will help propel our economic recovery efforts. As Thornburg (2009) states ‘We must get our science students and scientists to begin thinking of the sciences as a possible career path’. Unfortunately as Thornburg (2009) laments, too much of the teaching in science worldwide is limited to lectures straight from textbooks. Thornburg (2009:5) further states that “it seems to me that too much science instruction is based on imparting a body of knowledge to the students and then having them apply this knowledge to some pre-defined problems (complete with answers in the teacher’s edition of the text!)... Engineers for example must be helped to use scientific knowledge to design and fabricate objects of the advancement of [our economy]. Science must not be reduced to the mere accumulation of facts.

Furthermore, as Thornburg (2009:7) states “a major challenge in transforming science into inquiry-driven project-based learning domain is staff development” Support needs to be given to upcoming scientists on a consistent basis to enable them move away from textbooks science to innovation and creation. As Thornburg (2009:7) states ‘the knowledge of textbook delivered

science facts does nothing to develop the capacity for scientific reasoning'. Further, as Hanna (2017:5) states:

I am concerned that scientists in our field are tending to converge on conclusions and theories that have very little experiential proof. It is a troubling phenomenon induced by a group of scientists that are very well publicized and publicly active and can effectively turn publishing solid work being generated by others in the field that challenge popular dogmas into an uphill battle. Further, it is much easier for new investigators and newcomers to the field to align themselves with these dogmas and further pursue possibly wrong directions in order to obtain funding and "succeed."

Indeed as Zamboni (2017:5) has pointed out relative to the scientific community in Brazil: '... many funding agencies value the number of the papers published by a scientist, instead of favouring the quality of the science produced.'

In Zambia, the problem discussed above is evidenced by lack of practical work at the secondary school level where practical work is only conducted in a few subjects such as geography and biology. This scenario continues even at the tertiary level. This makes it even more necessary to facilitate mentorship for scientists who may be learning certain practical aspects for the first time at the investigation stage which should ordinarily be at the consolidation stage. With a background that has despised the vocational and adored the academic pathway, it was hard to see how a steady flow of scientists would be channeled out of our education system.

To succeed in their careers scientists must combine theory with practical work and must be well prepared. Science must avoid the problem that is there in arts courses in Zambia as Mulenga (2015) found that over 60% of University of Zambia students pursuing the Bachelor of Education degree reported that the content of the degree was not related to the knowledge and skills set needed for teaching in a secondary school. This needs to be addressed during teacher training at design level so that what they learn is tailored towards the needs of the school.

It is in recognition of the limitation discussed above that the Government of the Republic of Zambia through the Ministry of General Education came up with the New Curriculum Framework in which it is advocating a linkage from one level of education to the next (Ministry of Education, 2013). This shift requires mental shift in view of the new aspects been introduced in the curriculum. In this arrangement, career guidance and mentorship should be accorded a significant role in our education system. This type of scientific mentorship is important particularly given that the Zambian education system has a lopsided leaning

towards academic orientation at the expense of scientific innovations as mentioned earlier. This should force key players such as science-based tertiary institutions to review their programmes and re-evaluate the caliber of the graduates that they are producing.

Science-based mentoring programmes

Mentorship of science students will ensure that all science students at least undergo a certain level and standard of socialisation in order to have a certain quality of scientists that can be expected to contribute to scientific innovation. Experience and research show that mentoring can achieve the above purposes quite readily and very effectively when the process is individualised. This entails promoting scientific investigation as a way of life, a career and not something incidental to ones' work.

Benefits of mentoring to science students and newly qualified scientists

Literature around the world is full of arguments for the purpose and outcomes of mentorship for science students and newly qualified scientists. All the authors discussed this far seem to be pointing to the fact that mentorship of NQs has benefits. The next section specifically discusses the some of the well-known benefits of mentorship of NQs, not only to NQs but also to other relevant stakeholders. Scientists have to be mentored because of an identified need that requires attention. Key to the success of such a programme are issues of collegial understanding. In general terms, the intention of all mentorship programmes is to transform a NQ into a competent career scientist.

A satisfied mentoring relationship will eventually help towards a better career goal and career advancement among scientists, attained through a process of self-discovering in a learning partnership. Seen from this view, the goal of mentorship focuses on addressing the needs of NQs so that they gain more knowledge and insight into what is necessary for increasing their innovative capacity either as students or as young scientists. After all, the purpose of revising the curriculum is to try and improve the learner outcomes and make curriculum content more relevant to the learner. This is critical to understand given that mentoring is the shared assumption that mentoring is a learned behaviour that can be taught and be learned.

Mentorship can help to bridge the gap between outdated theories taught at universities and current practice in industry brought about by constant technological changes. The capacity to develop professional competence in NQs early in their practice has profound implications for innovative achievement. Scientific innovation and investigation must provide for incentives. In the absence of incentives, monetary or otherwise, for those expected to mentor NQs, there might be little motivation among veteran scientists to provide mentoring to newly

qualified scientists. What this means is that there is need to set agenda for areas in which mentorship is important for implementation. This becomes even more significant when considered against the fact that mentorship is voluntary and reciprocal and cannot therefore be imposed on veteran scientists.

Prerequisites for formal mentoring

There are a number of factors that should be taken into consideration by curriculum designers and policy makers when effecting a programme of the magnitude envisaged in the new curriculum framework. Planned mentoring is most successful when linked to clear, well-defined and achievable goals. Therefore, as we teach students science subjects we must have clear goals and foresight of what we want them to become. There are specific goals toward which the mentoring relationship is focused with specific goals, criteria for participation and clear expected outcomes, such as personal growth and career development, among others. In short the educational system must be visionary. When the Americans saw the Russians land on the moon they revised their education system to produce scientists who could land on the moon. The rest is history.

This requires similarity of experiences. When the mentor's responsibilities discussed above are fully and meaningfully carried out, the NQS is expected to have developed competencies in the areas in which they need help. After all, the necessity for mentorship of students lies in its contribution towards developing effective and competent scientists.

Conclusion

The essence of this paper was not to catalogue challenges of science education in Zambia but to show that the solution lies in instituting mentoring for science students and up-and-coming scientists if they are to contribute to national development. Considering the current economic challenges that Zambia faces, it is high time we re-looked science education to better position our science students on the path to becoming innovators. What is important is not the number of scientists or even their qualifications but rather their output in terms of contribution to scientific and technological innovations. It is therefore necessary to reduce repetition, stagnation and costs associated with scientific investigation. Considering the many needs that NQs have, such as lack of infrastructural facilities and lack of government support, mentorship is of the essence as it will help science students and NQs marry theory and practice. This will assist scientists' professional growth. Without this continuity new scientists learn through time consuming and stressful trial and error.

Recommendations

1. We must have a solid lab-based science orientation from high school and tertiary level training. There is great need to marry theory with practice. This calls for the institutionalisation of mentorship backed by policy as opposed to mere dependence on the good wishes of those able to provide such mentorship.
2. The prowess of a scientist should be judged by their contribution to scientific innovation and not their knowledge or debate of scientific facts as represented by the journal their arguments are published in.
3. Mentoring is a way to promote growth in science and science-based fields. For our scientists to find their place in a highly competitive international marketplace through discovery and innovation, learning institutions should therefore take on mentoring in their programmes.

REFERENCES

- Allotey, J (2005). Overcoming challenges: the case of the young scientists in Africa. *African Journal of Food Agriculture Nutrition and Development*, Vol. 5, No. 1
- Clutterbuck, D. (1991). *Everyone Needs a Mentor*. London: Institute of Personnel Management
- Kram, K. E. (1985). *Mentoring at work*. Boston: Scott, Foresman and Company.
- Lankau, J.M. and Scandura, A.T.(2007). Mentoring as a Forum for Personal Learning in Organisations. In: B.R. Ragins and K.E. Kram (Eds.), *The Handbook of Mentoring at Work: Theory, Research and Practice*. pp. 95-122. Thousand Oaks: Sage Publications.
- Leading Edge Voices (2014). *The Biggest Challenges facing young scientists*. Elsevier Inc.
- Maughan, B.D. (2007). 'Mentoring among scientists: Implications for Interpersonal Relationships within a formal mentoring programme.' Unpublished PhD Thesis. University of Idaho
- Maughan, B.D. (2006). *Mentoring among scientists: Implications of Interpersonal Relationships within a formal mentoring programme*. Idaho National Laboratory
- Mazerolle, S. M., Bowman, T.G. and Klossner, J.C. (2015). 'An analysis of doctoral students' perceptions of mentorship during their doctoral studies.' *Athletic Training Education Journal* 10(3):227-235
- Mentoring among Scientists-<http://search.proquest.com/docview/304850434>. Accessed 19/06/2017
- Curriculum Development Centre (2013) *Zambia Education Curriculum Framework 2013*. Lusaka: Curriculum Development Centre
- Mulenga, I.M (2015) 'English language teacher education curriculum designing: a mixed methods analysis of the programme at the University of Zambia.' Unpublished PhD thesis. University of Zambia
- Thornburg, D.D (2009) 'Five challenges in science education.' Thornburg Center for Space Exploration.