Studies in Continuing Education

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/csce20

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To cite this article: Ann Kingiri, Margrethe Holm Andersen & Rebecca Hanlin (2024) Mentoring as a pathway to building research capacity in the field of innovation and development studies in Africa, Studies in Continuing Education, 46:1, 101-120, DOI: 10.1080/0158037X.2022.2140333

To link to this article: https://doi.org/10.1080/0158037X.2022.2140333

STUDIES IN CONTINUING EDUCATION
2024, VOL. 46, NO. 1, 101–120
https://doi.org/10.1080/0158037X.2022.2140333

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Mentoring as a pathway to building research capacity in the field of innovation and development studies in Africa

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ABSTRACT

Mentorship may be conceptualised in terms of the form it takes, function it serves or it's learning centred nature which makes research in mentoring to receive attention within different disciplines. This article attempts to understand how a mentoring programme can contribute to enhanced research capacity building in the field of Innovation and Development (I&D) studies in Africa. It does this through a qualitative study of an African-oriented research capacity building network (AfricaLics) that aims at building a critical mass of scholars in I&D studies in the continent of Africa. Drawing on theoretical approaches in higher education that support systems of interaction thinking, the paper finds that more systematic and extensive mentorship, and awareness about different types of mentorship can enhance capacity building in the field of I&D studies. The paper recommends that development of an I&D mentorship programme must consider a mix of both structured and unstructured elements that are aligned to the local context. These context-specific elements are critical to building sustainable research capacity building programmes in academic disciplines that are transdisciplinary in nature such as I&D studies.

ARTICLE HISTORY
Received 27 August 2021
Accepted 21 October 2022

KEYWORDS
Mentorship; innovation and development studies; research capacity building; AfricaLics; Africa

Introduction

Mentorship activities in low income and low-middle income countries were traditionally uncommon but are becoming popular since they create an opportunity for learning requisite skills in a given field (Prasad et al. 2019; Lescano et al. 2019). Mentorship is widely accepted in research domains like health sciences, organisational management, and lately in promotion of science, technology, engineering and mathematics (STEM) education. In academic health sciences, mentorship is critical in enhancing academic output, personal development and career path for students, fellows and junior faculty members (Sambunjak, Straus, and Marusic 2010; Nakanjako et al. 2014). Further, mentors-mentees relationship is mutual and creates opportunities for research, teaching, learning specific skills, and career and professional growth (Sambunjak, Straus, and Marusic 2010; Ssemata et al. 2017; Geber 2013). At the organisational level, mentorship

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is often synonymous with human resource development aimed at achieving higher productivity and performance (Gold and Bratton 2014; Baek and Kim 2014).

Scholarly literature is scanty on mentorship as a research capacity building[1] tool. However, there are a number of on-going mentoring practices in Africa that are academically oriented. These include the African Academy of Science mentoring scheme[2] and the African Women in Agricultural Research and Development (AWARD) mentorship programme.[3] In the health sector, there are traditional mentoring practices motivated by collaborations between institutions in high- and low-income countries (Schwerdtle, Morphet, and Hall 2017).

This paper aims at contributing to filling the research gap related to the use of mentoring as a tool for research capacity building in Africa and in particular for the development of research capacity within the field of Innovation and Development (I&D) studies.[4] It is motivated by the fact that this field, which is an intersection between innovation studies and development studies is becoming increasingly acknowledged in research as well as in policy and practice debates, but so far with a limited number of qualified and active scholars in Africa. In addition, relatively few mentoring programmes exist in an academic higher education setting in Africa, and none is specific to I&D research capacity development.

The research that informs this paper attempts to answer the following research question: how can a mentoring programme contribute to enhancing research capacity building in the field of I&D in Africa? In answering this question, the study explores the key elements to consider when designing a mentorship programme, some factors that need to be taken into consideration and what the expected challenges would be. It does this through a qualitative study of an African-oriented research capacity building network (AfricaLics) that aims at building a critical mass of scholars in I&D studies in Africa with particular emphasis on low and lower-middle income countries. Sharing learning and experiences from the AfricaLics programme is important for other research capacity building initiatives that are interdisciplinary and social science focused.

The paper is structured as follows. The rest of this section briefly outlines the conceptual and theoretical embedding of the paper and provides an introduction to the AfricaLics Research Capacity Building (RCB) programme. This is followed by an outline of how data was generated and a discussion of some of the limitations related to the study. The results are then reported building on lessons learnt during the implementation of the RCB programme and the results of a survey of mentees involved in this programme. The paper finishes with the discussion and conclusion.

Mentorship as a research concept: conceptual and theoretical underpinning

The application of the mentoring concept as a tool for research capacity building and development varies across disciplines which results in lack of consensus in terms of a clear definition (Crisp and Cruz 2009; Roberts 2000; Jacobi 1991; NASEM 2019). This paper draws insights from the definition by Paglis, Green, and Bauer (2006) that focusses largely on a one-way knowledge transfer pathway. Paglis, Green, and Bauer (2006, 2) note that 'individual mentoring of doctoral students relates to guiding them through their research, inducting them into the academic community, introducing them to professional networks and launching their academic career through a supportive and

personal relationship'. This definition does not, however, take cognizance of the interactive learning processes that are embedded in mentee-mentor interactions, and we, therefore, suggest combining this definition with insights from authors who conceptualise mentorship from a learning perspective. Campbell et al. (2012, 597) have reflected on the learning-centered nature of mentorship characterised by 'reciprocal learning and focused on goal attainment and personal growth'. Arnesson and Albinsson (2017) further add that mentorship is a learning process that involves a mutual social interaction between mentor and mentee, with both parties experiencing motivation and participation. In our adapted definition 'individual mentoring of doctoral students relates to guiding them through their research, inducting them into the academic community, introducing them to professional networks and launching their academic career through a supportive and personal relationship based on mutual and interactive learning'.

Mentorship is accepted in many disciplines such as higher education, psychology and health sciences (NASEM 2019). In higher education, researchers have suggested that mentorship positively affects academic and learning outcomes (Muschallik and Pull 2015). Within business and organisation studies, mentorship help achieve higher productivity and performance through training, development in teaching, supervision, community engagement and career progression (Gold and Bratton 2014; Baek and Kim 2014).

The outcome of mentorship is closely linked to its functions and entails more generally career development and guidance, social and personal support and role modelling, promotion of academic success and research collaboration (Raabe and Beehr 2003; Arnesson and Albinsson 2017; Jacobi 1991; Paglis, Green, and Bauer 2006). Mentorship creates opportunities for research, teaching and specific skills as well as career and professional growth (Sambunjak, Straus, and Marusic 2010; Ssemata et al. 2017). Mentoring is seen as an effective way of getting students to transition into a new disciplinary culture and it gives them a sense of belonging and a chance to become more self-assured (Lunsford et al. 2017).

Mentorship at individual or organisational levels may be needed by different social groups and in different contexts (for instance academia or workplace) and may be useful at different stages of career development (undergraduate, graduate or early career stage), resulting in varying mentoring outcomes. Mentoring at individual level impacts skills and knowledge development and may lead to establishment of partnerships for professional development, and social and organisational change (Baek and Kim 2014; Geber 2003; cited in Geber 2013).

Mentoring relationships are dynamic and may be formal and informal, enhancing knowledge and interactive learning (Lave and Wenger 1991). Formal mentorship in a workplace, educational institution or research network involves a structured support that is provided for designated periods of time and with clear deliverables and expected outputs. Informal mentoring is likely to emerge naturally over time and may focus on long-term goals. In this paper, mentorship is conceptualised broadly as encompassing both informal and formal elements.

It is easy to confuse mentorship with supervision. Both entail interaction between a knowledgeable and experienced person on the one hand and a less competent person on the other (Arnesson and Albinsson 2017). Mentorship is characterised by reflection

and analysing discussion, is voluntary and may or may not include formal evaluations. Supervision on the other hand also has elements of discussion and reflection as a compulsory part of a process, but in addition includes mandatory and formal assessments (for instance of a PhD student by the supervisor). The two phenomena are thus different, but in practice, the boundary between supervisory tasks and mentorship activities may be blurred. Mentors may undertake basic supervisory roles, on a voluntary basis, while supervisors may take on roles, often seen as mentorship roles. Both supervisors and mentors are likely to use a range of mentoring techniques (e.g. active listening and feedback) in their interactions with students (Lauvås and Handal 2015).

Research on mentoring often lacks a theoretical base or discusses this implicitly (Jacobi 1991; NASEM 2019). However, of particular interest to this article are theories that recognise the value of relationships in a social system, thereby promoting an environment for social learning. Learning in a mentorship relationship is brought about by social interaction between mentor and mentee (Arnesson and Albinsson 2017; Jacobi 1991). One such theory is the Social Network Theory (SNT) which focuses on how individuals are connected in a social system, for what purpose, and to what end (NASEM 2019). It explains mentorship as a system of interacting components in which the relationships in that system can represent a range of social behaviours. The SNT recognises the importance of interaction and learning embedded in a system in shaping the mentor-mentee interaction which Prasad et al. (2019, 10–11) describe as 'systems of interaction'. According to Prasad et al. (2019), a theoretical framework derived from a system thinking perspective considers the dynamism emerging from a mutually beneficial mentee-mentor interaction. It also takes cognizance of the importance of the need for an enabling institutional environment for a successful mentorship. As such, a systems view of the interaction in mentorship is critical because it recognises the context within which mentoring occurs. In this paper, the focus is on the African context, particularly that of low-income and low-middle-income economies.

Social learning-oriented theories may be more relevant for graduates and early career scholars, who are likely to undergo higher levels of socialisation and career preparation through mentorship activities as opposed to undergraduates (Torres, Jones, and Renn 2009; Weidman, Twale, and Stein 2001). Socialisation is a process through which individuals gain the knowledge, skills and values necessary for successful entry into a professional career requiring the advanced level of specialised knowledge and skills (Weidman, Twale, and Stein 2001). Moreover, socialisation as a learning process within academia may enhance transition from being a good course taker to being an independent researcher (Lovitts 2005). Arguably, socialisation is necessary for interdisciplinary and social science-oriented fields of study like I &D which is the focus of this paper.

This article focuses on the use of mentorship in the academic and higher education setting as a tool for enhancing research capacity building targeted at the I&D research community in Africa.

Africalics Research Capacity Programme: context and mentorship infrastructure

The African Network for the Economics of Learning, Innovation and Competence Building Systems (AfricaLics) is an open and diverse community of scholars working on

innovation and competence building in the context of Africa (www.africalics.org). AfricaLics' vision is to see African countries developing and utilising high quality research at the intersection of innovation studies and development studies, conducted by African researchers. Since its formal inception in 2012, AfricaLics has benefitted from financial support from the Swedish international development cooperation agency (Sida), for research capacity building (RCB) activities namely: residential and online PhD academies, a Visiting Fellows Programme (VFP), research conferences and stakeholders' outreach. The total amount of funding received by 2019 is in the range of 4.3 million US dollars (Technopolis 2021).

From 2012 to 2020, 200 PhD students across Africa have been trained through the AfricaLics academies, 29 in the AfricaLics PhD VFP, and three young scholars in the pilot Post Doctoral VFP on early career development. In the same period, a total number of 460 scholars have presented papers at AfricaLics conferences. As of 2019, the membership database for AfricaLics stands at 630 members having started at just over 100 in 2012. Arguably, the number of researchers interested in I&D on the African continent is clearly increasing.

Mentorship within AfricaLics is perceived as an interactive process between someone with considerable experience in the field of I & D studies and someone (e.g. a post-graduate or early career scholar) who wants to learn from this experience. In the best cases, the interaction leads to mutual learning. Mentoring can relate both to specific skills (e.g. writing a good conference paper or a journal paper), but can also be broader and related to attaining knowledge in the professional field or how to build a career. It follows from this that, mentoring within AfricaLics is conceptualised more broadly based on its informal and formal elements as exhibited in different capacity building activities (Table 1).

Table 1. Major AfricaLics mentoring activities.

	PhD academies (ongoing, formal)	PhD VFP (ongoing, formal)	Dedicated conference mentoring (ongoing, formal)	Dedicated publishing mentoring (planned)	Ad-hoc and informal mentoring
What?	Feedback on papers/ proposals submitted by PhD students	Feedback on papers or chapters of dissertations or proposals. Personal development support	-Feedback on draft papers to improve paper articles prior to submission for AfricaLics or relevant conferences	Feedback on draft articles & dedicated support towards publishing	Junior and senior scholars meet informally to exchange views.
How?	Senior I&D scholars + peers provide oral and/or written inputs.	One junior and one senior mentor provide oral and/or written feedback. Peers and coordinator also provide comments.	Senior I&D scholars from AfricaLics provide written or oral inputs on research articles		Informal interactions e.g. at a conferences
When?	One-time input (during academy); sometimes with informal follow up	Multiple sessions during study period. In some cases, with follow up after study period ends.	Multiple rounds - depending on interest of mentee.		Conferences, other events

Source: Authors.

The dedicated mentorship activity mentioned in the table entails young students/scholars from Africa getting a chance to work with experienced scholars working within the field of I&D over an agreed time with the view to develop a paper for presentation at a relevant conference or for publication in one of the journals that are affiliated to the network.

Table 1 further illustrates some of the potential and real overlap between classic supervision activities and mentorship, which in the context of the VFP has led to the development of quite elaborate instructions for mentors to ensure that they provide complementary support to the students rather than substitute supervision from universities in Africa where the students are enrolled.

The AfricaLics approach to mentorship takes note of the resource limited setting (human, technical and financial) and the nascent nature of the field of I&D studies in Africa. Hence, the approach is tailored to help the mentees to become more technically competent in the field in terms of understanding, review, analysis and application in their respective areas of research or academic interest. This is particularly important in the field of I&D studies because many students come from disciplinary fields and/or quantitative traditions and with limited exposure to interdisciplinary or qualitative approaches. They are also expected to be more confident, more visible, and better networked, as they build their I&D research skills thereby increasing their leadership potential in policy environments and in a socially responsible manner. The needs among PhD students (and to some extent their supervisors and research fellows) have proven to be twofold; one, the needs related to the content matter of I&D as a field – and two, the needs related to general academic competences (for instance conducting systematic literature reviews, quantitative and qualitative research methods, journal article writing). Exposure and options for interacting with scholars already active in the field of I&D studies have been limited, yet it is key for the development of the capabilities required. This context has largely informed the design of AfricaLics mentorship activities and has been a motivation for the research that informs this paper. Thus, while in general terms the types of mentorship support may be similar to those offered by others e.g. African Academy of Sciences, the content of that support is different, given the nascent status of the I&D field as an academic arena in Africa.

The notion that high-quality PhD supervision and mentoring is key for PhD students to conduct high-quality research and completing their PhD work on time has been a key assumption behind the work of AfricaLics aimed at supporting individual PhD students. But as noted by other scholars like Manathunga (2005), the quality of supervision is not a sufficient factor in this process. According to Latona and Browne (2001; quoted in Manathunga 2005), other important factors include institutional and environmental factors (including research culture and institutional support) and student cohorts and characteristics.

Research data and limitations

The study adopted a qualitative case study, where the focus was obtaining in-depth knowledge of how mentoring contributes to enhancing research capacity building in an emerging field of study, the I&D studies in Africa. The case study was the AfricaLics RCB Programme whose context is described in the preceding section. Several sets of data

have been collated linked to activities under this programme implemented between 2012 and 2019.

(1) The first set of data relates to qualitative analysis of the mentors and mentees experience on the AfricaLics pilot mentorship programme that commenced in 2018 and involved 14 mentees with accepted papers at the 2018 Globelics conference. Their experiences were recorded through evaluation of feedback obtained using questionnaires, emails and interview notes of mentees and selected mentors. This is complemented by discussions on mentorship as an agenda item during two AfricaLics Scientific Board (ASB) meetings (one in Accra, 2018 and another in Oran, 2017), a brainstorming workshop held at the Aalborg University in Denmark on 8 April 2019, an AfricaLics pre-conference meeting held at University of Dar es Salaam on 17 April 2019 and a preconference mentoring event held in Accra, Ghana in October 2018.
(2) The second set of data relates to content analysis of key documents compiled between 2012 and 2020 as part of activities under the AfricaLics network. These documents include baseline surveys of the science, technology and innovation (STI) community in Africa and reports of two external evaluations undertaken in 2015 and 2020–2021 on the programme (Rambøll 2005 and Technopolis 2021). These were further complemented by review of reports from discussions and seminars focusing on mentorship as a tool for capacity development in the field of I&D studies involving members of AfricaLics network.
(3) The third set was survey[5] that involved scholars who had participated in AfricaLics capacity building activities between 2012 and 2019. The survey questionnaire comprised of five parts: benefits of mentoring; availability of opportunities to engage in mentorship; ideas for designing a mentorship programme in the field of I&D studies targeting African scholars; prerequisites for a successful mentorship programme and appropriate mode of interaction/engagement. 31 out of 61 respondents replied to a request to participate in the survey when the questionnaire was sent out to a targeted focus group (PhD students, early careers and senior scholars), equivalent to a 50% response rate (Figure 1).

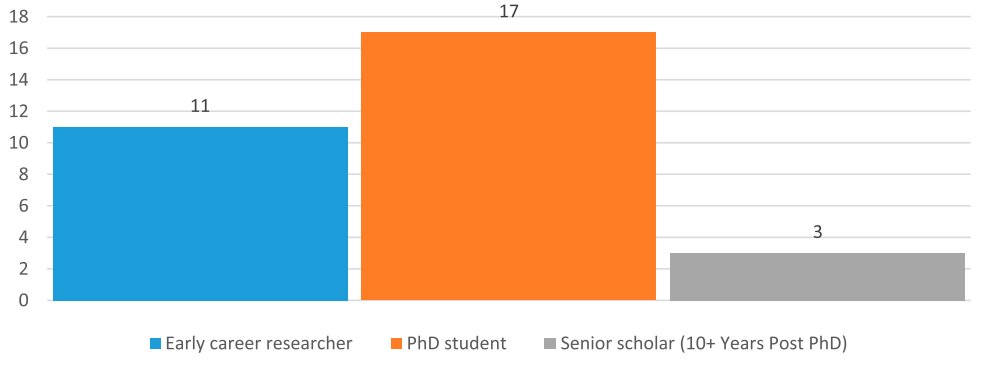

Figure 1. Respondents' research career level ($n = 31$).

The interpretation and analysis of the data sets can best be described as a qualitative content analysis using a narrative approach. Focusing on narrative (but not using a narrative analysis method per se) meant that through the reading of the empirical material, we focused on the content in the text and on the sentences and words that carried meaning to understand the stories that are being told (Riessman, Huberman, and Miles 2002) and perceptions of mentorship underpinning them. We searched for meaning in the narrative running through the content of the qualitative text in the surveys, interviews and other data texts. For the survey, data were extracted question by question to individual worksheets to enable detailed analysis by question. Data analysis entailed summative descriptive statistics.

This was a simple exploratory case study and had some limitations. Our survey was limited in terms of reach because we targeted a small cohort of AfricaLics capacity building beneficiaries. This was deliberate because we wanted to understand how mentorship had occurred for those within the network. Thus, a purposive sample of those who had participated in mentorship can inform the development of a network-level mentorship strategy and advance the development of mentorship activities within the network. The varying numbers of responses can be explained by the varying categories of research career levels namely: early career scholars, PhD students, and senior scholars (Figure 1).

We were aware that this could result in a risk of selection bias, but this was minimised by inclusion of a mix of respondents who had different types of experience with the capacity building instruments (PhD academies, VFPs and conferences) that were being assessed. The downside of this approach was a certain level of fragmentation in responses because not everyone had the same/direct experience with all forms of mentorship and not all forms of mentorship are equal in depth and breadth. Arguably, these limitations did not however significantly influence the interpretation and subsequent analysis of the findings that are reflected in the subsequent sections. This is because the survey results were also triangulated with analysis of other sets of primary and secondary qualitative data referenced in (1) and (2) above. This is captured in the discussion and conclusion. Overall, we noted that there are benefits to be gained from the findings as several areas of our study can inform more detailed interrogation in the future, for instance through strategic interviews and focus groups discussions.

Results: mentorship as a pathway for building I & D research capacity

This section summarises the key study findings both from the qualitative data and survey data. It starts by elaborating on the results related to the pilot programme for a dedicated mentorship programme and continues by reporting on more general experience and lessons learned concerning mentoring as a tool in the various AfricaLics activities.

Initial reflections on the pilot mentorship programme

The pilot dedicated mentorship programme that occurred in 2018 involved providing mentorship support to 14 early career researchers from low- and low-middle-income countries in Africa. As part of routine monitoring and evaluation, reflections on the pilot programme took place. The qualitative data generated from the reflection and evaluation activities was reviewed as part of efforts to develop a mentorship strategy

for the network. The results show that, mentorship support was perceived to be useful by all the 14 beneficiaries. However, the participants cited two key logistical challenges summarised below that confounded the ultimate effectiveness of the pilot programme.

Resources constraint

Both human and financial resources were found to be paramount for success of a mentorship plan. In the field of I&D studies, there is a limited number of scholars, especially in Africa (Kingiri et al. 2019), which limits the process of mentor-mentee match making. In addition, some mentees (the majority of which were drawn from low-income countries) encountered internet access challenges. This complicated a sustained virtual long-distance engagement with the mentors. It was suggested that a facilitation fee for mentors and mentees could help in offsetting some logistical challenges like communication and internet costs. It was also noted that some initial face-to-face trainings for both mentors and mentees are very necessary but could be difficult to organise due to the cost element.

The field of I & D studies and other disciplinary fields compromise

For the I & D field of study, embedding innovation thinking across varying disciplines is notably a challenge. Some senior scholars expressed concern that the programme might be 'pushing innovation thinking' to scholars that are already shining in their disciplinary fields. The challenge is to make these scholars interested in innovation studies and sustain their interest while not destroying their opportunities in other fields of interest.

The review of these initial reflections highlighted the need for more analysis of the programme's wide range of factors that may hinder an effective mentorship scheme in the African context. This motivated a decision to conduct a more comprehensive survey regarding issues related to mentoring as a tool for AfricaLics capacity development across all mentorship activities. The sections that follow discuss results of the survey.

Survey results

The answers given to the survey questions by the 31 respondents were analysed and the findings are presented here collated around five overarching results areas (and somewhat related to specific sections of the survey tool).

Mentoring promotes learning, skills and career development

The survey exposed key attributes of mentorship that could inform development of a strategy that takes into cognizance of the users' needs in different AfricaLics research capacity building activities.

There was a high level of consensus on mentorship as a relevant and beneficial tool in building I & D research capacity. Respondents ranked 'learning, skills and career development' as the topmost important benefit, with 'mentoring complemented home supervision' receiving the highest total weight. 'Publishing' and 'social support' were also considered important but ranked lowest among all the benefits. An elaboration on additional benefits through an open-ended enquiry put emphasis on 'personal academic oriented development and achievement', 'professional development through

opportunities for collaborative activities', networking' and 'critical thinking'. This study did not explore in detail the reasoning behind the perceived benefits.

Research capacity building activities as pathways for personal and professional development

The survey explored the respondents' understanding of suitability and potential for the different AfricaLics activities or capacity building platforms to contribute to individual mentoring. The results presented in Figure 2 show that AfricaLics academies are an important activity/pathway for individual mentoring at 87.1% (27 respondents selecting this option), followed by the network's social media platform at 77.4% (24 respondents) and then AfricaLics Conferences at 71% (22 respondents). One respondent disagreed that seed funding research projects could be a useful mentorship platform. No follow up was made to understand why this answer was given.

While not all respondents had first-hand experience with all platforms/activities (illustrated by either not providing a definitive answer or stating that they had not participated in the activity by choosing 'not applicable'), the majority of those who had interacted with each of the platforms agreed that the avenues they engaged in were important channels for mentorship in the field of I & D studies. The respondents gave varying reasons to support their perspectives as summarised in Table 2.

Conferences provide opportunities for networking and informal feedback on individuals' research work. The PhD academies, post-doctoral VFP and the seed funded research projects have got characteristics that support longer term personal and professional development. The category entitled 'social media platforms' includes the AfricaLics website and accounts on Twitter, Facebook and Linked-In and the more interactive WhatsApp groups that have been activated by AfricaLics alumni. The respondents found these useful for professional development and their own/self-mentoring.

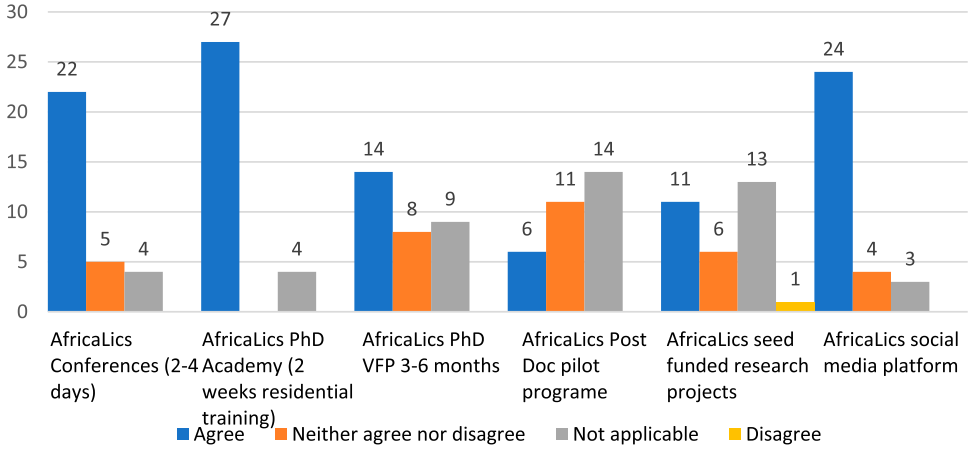

Figure 2. Respondents understanding of AfricaLics activities/platforms as potential to contribute to individual mentoring ($n = 31$).

Table 2. Respondent's understanding of opportunities for mentorship under different platforms.

Platform/activity	Summary of reasons cited	Reference to mentorship
AfricaLics conferences (2–4 days)	- Share and get feedback on research work mentors - Learning opportunities from mentors and peers - Bridge development-related knowledge gaps relevant for emerging economies - Networking including identification of professional acquaintances - Impact new ways of thinking and broadening research skills - Academic achievement enhancing successful examination and publishing	Professional development with minimal personal development
AfricaLics Academy (2 weeks residential training)	- Peer -to-peer learning - Learning among diverse cultures and national backgrounds - In-depth research capacity skills development in I & D studies and embedding innovation thinking in research work - Learning from experts - Instilled confidence to interact in professional setting - Early completion of PhD studies	- Peer and expert mentorship - Personal skills development
PhD VFP 3–6 months	- Long-term residential placement complements internal interaction - Quality of PhD and publishing skills improved due to access to mentors and resources - Academic and professional transformation (with indicators of success like accolades, timely completion of studies, reflexivity, published articles and improved negotiation skills) - Confidence in innovation studies - Professional networking	Professional and academic development
Post Doc pilot programme	Empowers early career researchers in Africa - Commitment to research - Improved innovation skills - Access to experts and relevant resources	
AfricaLics social media platforms	- Sharing information and networking	
AfricaLics seed funded research projects	Co-development and joint learning in collaborative projects and workshops - Enhanced research and collaboration - Leadership and publishing skills, project management and fundraising - Financial support	Personal, professional and career growth

Source**:** Authors from survey data.

Key considerations in designing a mentorship programme on I&D targeting African scholars

The survey investigated the understanding of respondents on issues of relevance in the design of a mentorship strategy for the I&D field. The results indicate that slightly

over half of the respondents (58.06%) prefer a mixed programme with both structured and unstructured elements. The remaining 41.94% prefer a structured programme. Nobody selected a wholly unstructured programme, indicating that respondents agreed on some level of formality in a future dedicated mentorship programme. A structured programme would entail a formalised process detailing key mentoring elements and could have an embedded monitoring and evaluation guided by a work plan on deliverables and timeline (among others). A more mixed programme of activity would include a series of formal opportunities for mentorship (e.g. through the VFP or PhD academies) with more informal opportunities for mentorship that are provided through other activities conducted by the network (e.g. networking at conferences) that occur ad hoc and are not designed to occur in a structured manner.

The respondents who selected a structured programme were further asked to state what form should such a programme take by selecting multiple options from a predetermined list of five choices. The results in Figure 3 show that 11 respondents (out of a total of 13 who answered the question) preferred a programme that prioritises I&D oriented methodology training. The second option proposed by 10 respondents was a programme that provides for a post-training follow-up of between 3 and 6 months after attendance of the VFP or a PhD academy. The third option proposed by nine respondents was a structure that focusses on relevant theories in the field of I & D studies. One respondent proposed a programme that provides training and support in very specific methodological skills that include data analysis in innovation studies, mixed methods, new software training and training in co-authorship. We find it somewhat surprising that the majority of the respondents did not regard involvement of mentees home institution (a

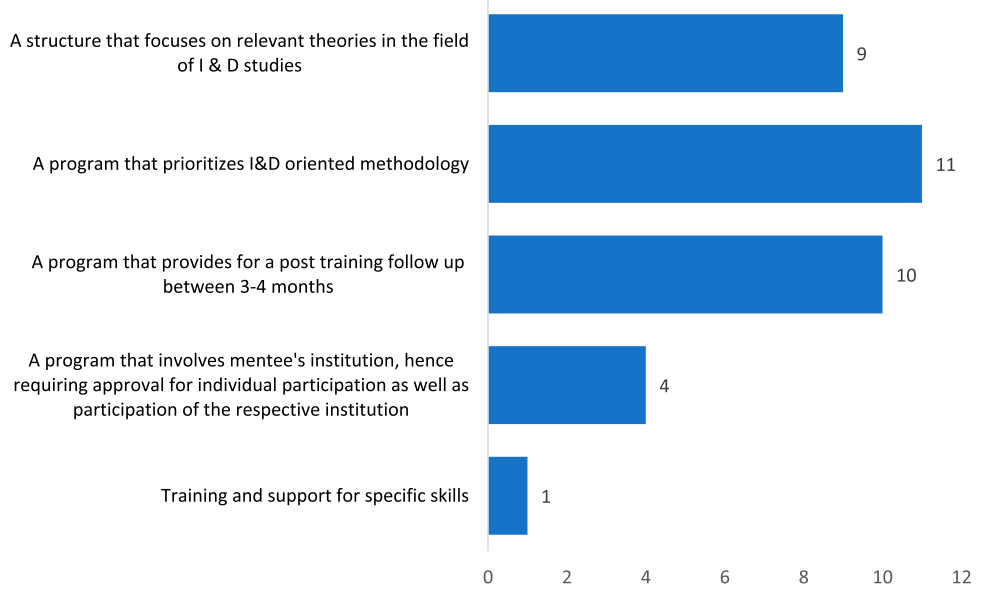

Figure 3. Respondents understanding about the form a structured/formal mentorship programme should take ($n = 13$).

programme that has an institutional collaboration component) as important. No explanations were provided on this and as such is an important area for further research.

Each of the six (out of the 18) respondents who preferred a mixed mentorship programme provided suggestions on its design. These suggestions are the creation of a competitive formal mentoring that allows for pairing of programmes as well as organising dedicated mentoring events; a flexible programme that accommodates mentor-mentee needs; a curriculum and assessment as well as a provision for inclusion of ad-hoc inputs on the programme that are commensurate with changing needs of the society; incorporate into the programme boot camps, academies and some form of financial support/fellowships; a long-distance mentorship programme combined with some face-to-face meetings; and finally, a programme with publishing and guidance oriented collaborative opportunities.

Communication and clarity of roles critical for a successful mentorship outcome

All the respondents agreed that communication between mentor and mentee should be sustained since it is essential to achieving the intended mentorship outcome. The need for drawing up a mentorship plan with clarity of roles and expectations was emphasised. In addition, to cement a healthy mentorship relationship would require deliberate relational commitment as well as external support involving resources (human, monetary, competence and institutional).

A mix of physical and virtual engagement channels enhance effective mentor-mentee interaction

The respondents were asked to select the most effective mode of interaction between a mentee and mentor from a predetermined provided list. The analysis showed that the majority of respondents (above 70%) perceive face to face ($n = 24$ out of 31) and email ($n = 22$ out of 31) as the most effective modes while video messaging, text messaging and phone interactions were deemed less effective with below 25% as a rating. The respondents, in an open-ended question further added that the social media platforms like WhatsApp are also effective.

The respondents selected more than one mode of engagement, which implies that multiple methods are complementary and likely to deliver better results. This was further clarified in the follow-up question whereby the majority ($n = 24$ out of 31) noted the best and productive mentorship relationships thrive on frequent face-to-face interactions complemented by virtual interactions. This response was further supported by varying reasons which when collated spanned across the following categories: affordability/cost; accessibility; efficiency; effectiveness; timing; nature of activity; reliability, and convenience.

In terms of frequency of engagement in a mentorship programme, there was an agreement that interaction should be flexible and reasonably frequent with a clear regular regimented pattern of engagement to foster a better bond between both parties.

Discussion

The analysis of the study results provides useful information with regards to relevance of mentorship and how it contributes to research capacity building in the field of I&D

studies. In addition, the factors to consider in designing a dedicated mentorship programme for enhanced capacity building in this field are also discussed.

Formal vs informal mentorship towards professional development

Mentorship within AfricaLics has largely taken both a formal and informal approach. The formal approach entails provision of support to PhD students but does not overtake the formal supervisory support provided by the university appointed supervisor. Often such mentorship in universities might be more focused on pastoral support, however, in this case, because few of the students' supervisors are qualified I&D experts, the mentorship provided through the AfricaLics network is targeted to provide academic guidance. The mentorship support includes methodological and writing advice, which leads to different outcomes for instance a better chance for having a conference paper accepted for a relevant I & D event, research collaboration, and development of practical skills that enhance critical thinking. In this sense, AfricaLics mentorship is focused more on career development than psychological, emotional or role model support alluded to by Jacobi (1991). Paglis, Green, and Bauer (2006) and Geber (2013) note that career-oriented mentoring stimulates new research projects and collaboration opportunities. This may ultimately impact organisational system performance (Geber 2013; Baek and Kim 2014).

Formal mentorship within AfricaLics is linked to the support that is provided for designated periods of time and with clear deliverables and expected outputs. Formality can help ensure strategic goals and alignment of resources and may ensure enhanced monitoring of success. Formality is good for promoting a culture of mentoring towards getting students to transition into a new disciplinary culture (Lunsford et al. 2017). It also gives them a sense of belonging and a chance to become more self-assured. In a formal setting, there is knowledge being imparted and interactive learning (Lave and Wenger 1991).

Interlinkages and systems thinking

AfricaLics mentoring activities seem to be distinct from the traditional activities such as coaching, advising and sponsoring that are positive mentoring consequences in addition to improved performance and personal growth of mentee and mentors (Roberts 2000). Overall, the AfricaLics platforms stimulate interactive learning through the various activities undertaken including lectures, seminars, matching mentees with potential mentors and the overall integration of theory and practice in the field. This is in agreement with Arnesson and Albinsson (2017) who demonstrate learning that emanates from social interactions as a key process of mentorship. In addition, interaction and learning shapes the mentor-mentee interaction which Prasad et al. (2019, 10–11) describe as 'systems of interaction'.

The findings are in agreement with other studies (for instance Geber 2013; Baek and Kim 2014) that demonstrate the need for an integrated approach to mentoring. This further enhances systemic and transformational change at individual and organisational level. The scope of this survey did not include generation of data on needs for developing capacity at home institutions, but this is certainly an area for further research. The

AfricaLics VFP has – over time – had the intention of rendering support also at the institutional level, but such efforts have generally been difficult to implement given limitations with funding, the small number of students from each participating African university and institutional and administrative differences between universities. Thinking about individual and institutional capacity building are essential if a systems approach is taken given the bound-together nature of these two elements if universities are to grow their teaching, research and service pipelines. Systems thinking recognises the interlinkages between activities and the need to provide an enabling environment for enhanced learning (see discussion of SNT in this paper).

A successful mentoring relationship involves a multiplicity of factors. These include good communication and clarity of roles and expectations between the mentor and mentee. The findings show that to cement a healthy relationship would require deliberate relational commitment as well as external support involving resources (human, monetary, competence and institutional). The competence and resources at an institutional level are important for efficient match making commensurate with the needs of mentors and mentees.

Breadth and depth of a mentorship programme

The PhD academies, the post-doctoral VFP and the seed funded research projects as mentorship platforms support longer term personal and professional development. This is because participants get an extended opportunity to receive targeted and focused attention from peers, senior scholars and/or mentors. The social media platforms mainly serve professional development purpose through connecting the AfricaLics alumni and sharing of timely and relevant information. They are also helpful in generating a sense of belonging to the I&D community. Interactions and knowledge exchange through social media was rated highly by the survey respondents. This suggests that these channels could be easily accessible and available to anyone with an interest in I&D as opposed to, for instance, the very competitive PhD VFP. Such findings highlight the possibility of ensuring both breadth and depth of mentorship through a dedicated programme of activity that recognises a mix of different levels of support (and not just a distinction between formal and informal mentorship).

The findings suggest that, achieving a good balance in terms of breath and depth of training for enhanced research capacity building is important and not all platforms need to be the same. The PhD Academies and the VFP are already fairly structured and could be further re-designed and the preferences regarding level of structuring could be used to inform new activities, including a broader, need based dedicated mentorship programme.

The value of face-to-face mentoring versus resource constrained context

The study shows that the best and most productive mentorship relationships thrive on frequent face-to-face interactions complemented by virtual web-based interactions. The preference for certain modes of engagement depended on affordability; accessibility; efficiency; effectiveness; timing; nature of activity; reliability and convenience. The results suggest that context is important when making decisions on a mentorship programme

that is targeted at resource constrained environments. For instance, for low-income countries, virtual based interactions may be costly or inaccessible, and hence face-to-face interactions may be recommended or a mix of methods that may deliver a better outcome. On the other hand, improved access to internet and virtual forms of interaction in African countries may help improve access to long-distance mentoring.

Conclusion and recommendations

The main aim of this paper was to understand how a mentoring programme contributes to enhancing research capacity development in the field of I &D studies in Africa. In this article we have presented findings from various sources demonstrating how participants in various types of mentoring embedded in AfricaLics activities (Table 1) contribute to overall capacity building in this field. The study findings show that a combination of structured activities with more ad-hoc support, spanning from lectures and seminars to strategic dedicated support to mentees enhance interactive learning and improved research capacity. The formal and informal support to PhD students oriented to academic guidance leads to holistic career development manifested through improved performance and personal growth. The improved skills relevant for research and publishing, and ultimately increased capacity to publish in the I & D field as cited by some participants are examples of indicators of improved research capacity. It is important to note that significant indicators of impact on research capacity have been reported post-survey, but this new information has not been reported in this paper.

The above notwithstanding, this study proposes rethinking mentorship support that brings on board the mentees' institutions. This is because the universities' ability to grow their teaching, research and service pipelines would enhance better and sustainable results in the I &D field research capacity. Debatably, this should be supported through appropriate funding which is key for enhanced mentorship outcome and commitment (Ehrich, Hansford, and Tennent 2004).

The study has brought to the fore the important factors that can guide in designing a mentorship strategy in the I &D field. A notable conclusion is the strong emphasis among respondents for use of a mixed strategy that accommodates formal and informal elements of mentorship with right mode of communication. The results further suggest designing and implementing a mentorship strategy that takes into cognizance the specific needs of different researchers and institutional contexts. This is an important finding because mentoring is not a common practice in developing economies, especially in Africa (Prasad et al. 2019; Lescano et al. 2019). A context specific strategy therefore must take into account the unique needs and challenges of working across cultures and disciplines, and the mentorship resource-limited settings characterising these countries (Prasad et al. 2019; Ssemata et al. 2017; Crisp and Cruz 2009). This is critical to building sustainable research capacity building programmes in academic disciplines such as I&D in Africa that are transdisciplinary in nature.

Findings from the study are timely in that, a dedicated mentorship programme should take note of the rapid learning from efforts to digitalise due to the Covid-19 pandemic. In view of this, a virtual dedicated mentorship programme may be promising. Where possible, this should still include a face-to-face meeting between mentors and mentees. Making the dedicated mentorship programme virtual would help scale up mentoring

activities in the field and make the efforts less dependent on funding while reducing vulnerability towards external shocks such as the Covid-19 pandemic.

The study has revealed consensus and clarity on the importance of soft and practical skills for the respondents as it was linked to inadequate support via supervision at respective home institutions. This may call for rethinking the mentorship approach and incorporation of mentorship elements that promote the institutional capacity more generally.

Finally, the Africalics network comprises a diversity of countries with very different science and technology systems in terms of capacities, resources, and infrastructure. Going forward, there is need to draw more systematically on African countries or institutions that have more capacities and resources, while maintaining the international exposure critical for networking (for instance a continued involvement of international mentors from developed countries in the research capacity building efforts).

Notes

1. We use the term research capacity building here in the paper because this is the term used historically by the AfricaLics network, yet we note that there is significant debate on the pros and cons of using capacity building or capacity development (see Aantjes, Burrows, and Armstrong 2022). We use capacity building and development interchangeably in the paper and in both cases refer to it in the context of supporting the growth and enhancement of skills and capabilities.
2. The scheme supports career and professional development for early career researchers towards becoming a new generation of science leaders in Africa. It is designed to enhance mutual learning between mentees and mentors (https://www.aasciences.africa/mentorship-scheme).
3. AWARD mentorship programme is designed to empower women scientists through a capacity building programme that builds their knowledge of organisational contexts, skills in negotiation, collaboration, conflict management and leadership. See more at https://awardfellowships.org/fellowship/mentors/.
4. The field of I & D studies is multidisciplinary in nature and incorporates theory and methods from both innovation studies and development studies. It focuses on how innovation can be directed towards solving the problems facing Africa. It entails undertaking 'research on innovation' as opposed to 'research in innovation' (see Kingiri et al. 2019).
5. The survey was conducted before the Covid-19 pandemic and notably before the worldwide experiment with digitalisation. It would be interesting to know if these responses would be different following the experiences of mentorship in the pandemic.

Acknowledgements

The authors wish to acknowledge and thank Prof. Edward Lorenz and Dr. Geci Sebina Karuri who provided useful comments on the survey tool, Josephat Okemwa who supported in the statistical analysis and all the respondents who completed the survey. We also want to thank the anonymous reviewers for their excellent comments and suggestions for revisions of the first and second drafts of this article. Dr. Andersen completed most of the work on this paper while at the Department of Politics and Society at Aalborg University, Denmark.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

The authors wish to acknowledge the financial support for the research capacity building project from the Swedish International Development Cooperation Agency (Sida), contribution No. 54100141.

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