

Developing African Novice Researchers into Career Investigators: Innovative Options

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Abstract: *Over the last decade, Sub-Saharan Africa has experienced an increased volume of funding and training activities to support research capacity development. However, there are persistent deficits in the number of active investigators conducting independent research with their own grants. To address this deficit, research institutions need to find an optimal balance between the types of trainings conducted: the long-term trainings involving post graduate programs in particular disciplines and short-term, hands-on courses involving “learning by doing”. This article examines the impact of a five-year National Institutes of Health (NIH) seed training award aimed at strengthening grants administration infrastructure at Makerere University- Johns Hopkins University Research Collaboration (MU-JHU) in Uganda, focusing on early career investigators. Using short-term, hands-on courses in grants management, the trainees were equipped with specialized skills to enable them to independently apply for grants. As a result, the number of early career investigators with their own grants rose from four to 16 within four years. This article describes the impact of well-designed, need-based short-term training courses with a hands-on approach and the critical role of supportive, skilled research grant administrators in nurturing early career investigators.*

Keywords: *Early career scientists, Capacity building, Research administration, Long-term trainings, Short – term trainings*

Background and Objectives

Global research indicators show that Sub-Saharan Africa fares poorly in research compared to other regions and has the least number of researchers per million inhabitants. It also produces the lowest number of research scholarly publications and makes the least investment in research and development (Mohamedbhai, 2011). This has been further aggravated by the increasing exodus of human capital from academic and research sectors in Africa, which adds to the continent’s decreasing contribution to global scientific output, as well as the widening gap in science and technology between Africa and the rest of the world (Tebeje, n.d).

Many African investigators struggle to establish independent research careers. This is often related to the lack of a clear research pathway, as well as inadequate capacity support to define their research agendas and to develop professionally after they have completed their formal education (Johanson & Adams, 2004; Sawyerr, 2004). Given that significant numbers of the most experienced staff are due to retire – the “greying of the professoriate”- and that insufficient numbers of new staff are being trained, there is a substantial gap in the numbers of current midlevel researchers able to develop independent careers. The need to develop capacity among early career scientists and researchers to fill the gaps left by retiring experienced scientists has been identified as essential to sustain the future of the research activities (Harris, 2004).

Capacity building has been identified as the ‘missing link’ (Jaycox, 1993) or ‘a necessary precondition for the success of major socioeconomic development strategies’ (Moharir, 1994), and ‘critical to the development of many African institutions and development programs’ (OED, 2005). Various approaches have been tried too increase the capacity of research in the region. In some instances, to increase the quantity and quality of the research portfolio, the research institutions have devised long-term higher education trainings, such as master or doctoral programs. Producing a viable number of trained researchers has been found to be extremely difficult via these types of programs, given the high costs of education, high dropout rates and the slow time-to-completion rates in low- resource settings. For example, in 2007, across the region, the University of Botswana produced four Ph.D.s, the universities of Dar es Salaam and Ghana combined had 20, Makerere University had 23 and the University of Nairobi had the highest of the five with 32 doctoral graduates (Cloete, Bailey, & Maassen, 2011). The gap seems very wide compared with the US academic institutions, which awarded 48,802 research doctorate degrees in 2008 (Fiegener, 2009).

Most often, local Ugandan researchers who have received long-term training find themselves unable to succeed at their local institutions. This may be because whether gained at home or abroad, many of these formal long-term trainings offer less practical skills that can be transferred and applied in their settings. Indeed, several of the IEARDA trainees who had earlier attended long-term trainings in the USA or Europe speak of being unable to apply some of their acquired knowledge due to different challenges. For example, the lack of access to the journals they need, the lack of appropriate software to analyze their data, the lack of equipment to run new experiments or slow and unreliable internet connections, all contribute to their inability to reach their goals. Mentorship, career advice, on-going support, short-term trainings and orientations are critical to help the upcoming scientists adapt to new changes with the limited resources, limited networks, and poorly endowed research environments which often characterize their final job placements upon their return to Africa from long-term trainings in institutions from developed countries (Tetty, 2010).

Conventional strategies used in the past seem insufficient to deal with capacity challenges in international development (Cracknell, 2000). According to *The Nairobi Report*, published jointly by the British Academy and the Association of Commonwealth Universities (Harle, 2007), the key areas of support recommended for institutions to enhance early career research

include regular meetings; networks and access to funding sources, especially to gain seed funds for their early career research projects; an emphasis on publications; concept and research development; and access to supervision, coaching and mentorship as well as institutional support, will and commitment. This is backed by the nine key support requirements for strengthening health research capacity in Africa as identified by the African-led group, the Initiative to Strengthen Health Research Capacity in Africa (ISHReCA). ISHReCA's requirements can be summed up under three major themes: improve the research environment, support individuals, and support institutions. Appropriately addressing these areas requires a fine combination of long- and short – term research capacity development trainings.

Current interest in capacity development is based on the realization that development efforts cannot deliver sustainable results without institutions and professionals adequately prepared to meet technical responsibilities (Eade, 1997; Milen, 2001). Investing resources into programs that lack well-trained personnel is unlikely to deliver successful, long-term results, particularly given the redefinition of job responsibilities (Homedes & Ugalde, 2005). Many development efforts have failed because insufficient attention and funding had been devoted to strengthening human and institutional capacity (Dobie, 2005; Hawe, Noort, King, & Jordens, 1997; Kwapong & Lesser, 1990). Building and sustaining capacity requires organizational capacity as well as the expertise of individuals (Grisso, Christakis, & Berlin, 1995; Kwapong & Lesser, 1990). For organizations to reap the benefits of what may be considerable investments in the training, the processes of how trainees are selected, trained and provided with opportunities to utilize their newly acquired skills and knowledge is crucial (Godlee, 1995).

This article aims to share strategies developed through a five-year International Extramural Associates Research Development Awards (IEARDA) awarded by the National Institutes of Health (NIH) through the Eunice Shriver National Institute of Child Health and Human Development (NICHD) to the Makerere University- Johns Hopkins University Research Collaboration (MU-JHU). The IEARDA grant was designed as a collaborative project with four other research institutions: the Infectious Diseases Institute (IDI); the Joint Clinical Research Centre (JCRC); the Makerere University-Case Western Reserve University Collaboration (MU-CWRU); and the Grants office for the Makerere University College of Health Sciences (MakCHS). The overall goal of this seed grant was to introduce universities and research institutions in resource-limited countries to the grant application processes at NIH so they could successfully identify, apply, and manage NIH awards. A selection of innovative, short-term, institutional and individual specific low- cost capacity building activities and sessions were conducted to achieve the objectives of this grant.

As a result of the implementation of the strategies, the number of early career investigators at MU-JHU with awarded grants rose from four to 16 within four years. This article describes the impact of well-designed, need-based short-term training courses with a hands-on approach and the critical role of supportive, skilled research grant administrators in nurturing early career investigators. A detailed description of the administrative organization and training strategy will be provided in forthcoming articles.

Strategy

Makerere University- Johns Hopkins University Research Collaboration is one of the key affiliates of the Makerere University College of Health Sciences (MakCHS). The collaboration between clinical researchers at Makerere University and Investigators currently at Johns Hopkins University has been in operation since 1988, conducting biomedical research focused on the prevention of pediatric HIV/AIDS. Prior to 2007, a specific strategy of “long-term” training had been utilized through the NIH for early career Investigators through training programs such as Fogarty International Training, mainly leading to master’s degrees and very few PhDs. The focus of these degrees tended to be more on scientific growth and field specialization with less emphasis on grant management and administration. However, the strategy was not very successful in enhancing research management capacity or raising the abilities of local investigators to apply for extramural grant awards. Indeed, MU-JHU had neither a single directly awarded grant nor a single local Principal Investigator (PI) with a directly awarded grant until 2007, despite its existence as a research institution for over 19 years.

This five-year seed grant was designed to strengthen an existing research administrative infrastructure for the purpose of enhancing and supporting biomedical and behavioral research capacity and activities. This was the first time that an institution outside of the United States was awarded this type of NIH grant, and it was the first award to MU-JHU as an independent, nonprofit, and locally registered foreign entity able to directly apply for grants.

The IEARDA grant was designed to support a collaborative project with four other research institutions to achieve four major goals: 1) to strengthen research capacity through grant administration training; 2) to enhance the capabilities of early career scientists to independently and successfully apply for biomedical and behavioral research grants ; 3) to empower faculty staff with the tools to directly apply for research funds from NIH and other funding institutions; and 4) to provide basic technical support to the grant administration infrastructure.

As described below, the administrative structure allowed for a decentralized collaborative system of governance that still permitted the integration of administrative and training services. A strategy for the successful delivery of the training was developed and seven key initiatives for gauging success were identified. The approach included a focus on early career investigators, short-term practical courses, and processes for low-cost mentoring and support over an extended period of time. The key initiatives included: increasing the number of investigators conducting grant-supported independent research; establishing a grant management office at each of the collaborating institutions; providing cost-efficient training that met the stated needs of early career scientists and the administrative staff that would support them; establishing a network of mentors for early career scientists; and, widely disseminating information and materials developed through the IEARDA grant to institutions experiencing similar resource and capacity obstacles. Information to track success was collected in the following areas: 1) the number of participants trained and supported through the IEARDA capacity development activities through the MU-JHU Research Collaboration, 2) the number of new grants awarded and corresponding increases in the number of Investigators conducting independent research over the course of the grant period, 3) the visibility of an established Grant Support

Office at each participating institution; 4) the degree of interest and participation in the training activities, 5) the continuous, sustained support available for early investigators, 6) the target participants' preference for short-term vs. long-term trainings, and 7) the expansion of training networks.

Administrative Structure

The training activities on this grant were initially designed to benefit five key stakeholders and research affiliates within the MakCHS through a uniquely decentralized but highly collaborative system existing at the MakCHS. The original intended beneficiaries included the Grant Support Offices at MakCHS, JCRC, IDI, MU- CWRU, and MU-JHU. For purposes of clarity, MakCHS has a network of several affiliated semi – autonomous research institutions that conduct research under its umbrella. The IEARDA grant provided an opportunity to address the uniform grant and research administration challenges faced by all affiliates, while capitalizing on the geographical proximity of early career researchers and investigators, the interlocking locations and the strategic north – south collaborative linkages. The activities were also anchored on the already well-established levels of cooperation across these institutions. This highly collaborative design was vital to the success of the strategy and enabled the grant activities to be extended to more than 23 beneficiary institutions by the end of five years. Many of these synergistic factors were used positively to mitigate the costs of the training.

The IEARDA activities were centrally managed through a Secretariat based at MU-JHU. This Secretariat was comprised of the grant management administrators of the five key research institutions. The Secretariat staff were supervised by the IEARDA Principle Investigator (Henry Tumwijekye, Esq.) who worked closely with an advisory board composed of the directors of the affiliated institutions. The IEARDA PI and the Secretariat staff formed the management team responsible for directing the activities and implementing the training plan. The advisory board members provided expertise and input for all the training activities and played a crucial role in advising the Secretariat on training and technical support needs. The advisory board also played a key role in identification of appropriate target participants for the training. In addition, the recruitment of a dedicated Training Coordinator was crucial in facilitating the planning, management and coordination of all grant training activities, including collecting and storing all training data.

Preparing for the Project

In 2007, the IEARDA PI attended a 10-week training program at the NIH campus in Bethesda, Maryland, USA, followed by a long-distance mentorship by NIH program officials and specialists. This training was the first and most critical step in the training process since it enabled the PI and administrative lead to acquire the knowledge and skills required to run a successful program. This training also provided the PI with the tools to establish the training programs within the institutional strategic framework. In addition to the training received by the PI, the IEARDA Training Coordinator also attended a five-day NIH Grant Management workshop as part of the initial orientation. These two orientation and training steps for the two key personnel (PI and the Training Coordinator) provided a clear vision and strong

foundation for the successful support and implementation of the IEARDA training activities at MU-JHU.

The execution of this capacity building program relied heavily on existing infrastructure at MU-JHU, the host institution. The use of MU-JHU resources helped to defray some of the costs of training such as venue and facility hire, transport costs, and internet charges. The funding challenges due to logistical issues usually experienced by an institution in a limited-resource setting, (e.g. not receiving the check from the sponsor on time), were not an issue due to the financial support and backing provided by the MU-JHU Administration. In addition to providing free-of-charge training facilities, MU-JHU provided dedicated time by the training support staff. This ensured the success of the trainings, even when the training budget was fairly minimal.

Basic Needs Assessment and Development of a Training Guide

The first step for developing successful training strategy was obtaining information through a basic needs assessment questionnaire, with the aim of identifying relevant topics and appropriate potential trainees. The questionnaire was administered on the Institutional leadership, upcoming scientists; and the staff directly involved in grants and finance management at the participating Institutions. This assessment inquired about each institution's key gaps in different grant management areas including: the number of funded grants and investigators; the required institutional registrations for compliance with funding agencies; the numbers of early career scientists; the grant management courses attended by staff; the level of human resources available to support investigators with grant writing or management and identification of funding opportunity announcements.

Through this questionnaire, the team was able to assess the different and significant needs that required specific training intervention strategies to enhance grant writing and management capacities. A written training guide was developed using the results of the information gathered from the needs assessment questionnaire. The IEARDA team has utilized this guide successfully for the last five years. In addition, this training format has been successfully adopted by other key partners as an ideal training tool for training research administrators and investigators in grant writing and management in low-resource settings. The guide covers key topics such as tips on successful grant writing and management, accessing funding sources, logistics for effective grant support, electronic registrations for funders, data management and information dissemination and online literature reviews, among other key topics. Currently, a draft of this training guide is being submitted for review by the sponsor (NIH) with the intent of sharing it as an on-line tool for facilitating the conduct of short – term grant management courses in limited-resource settings.

Focus on Early Career Scientists

We relied on the identification of early career scientists with high potential to address the goal of strengthening the ability of institutional researchers to compete effectively for NIH funds, and to build a “critical mass” of junior investigators, as well as mentors. This was further

strengthened with a focus on administrators supported with training in practical aspects of grant preparation and submission. The early career scientists chosen as training candidates were those identified as demonstrating evidence of a strong commitment to a research-focused career as well as the need for additional mentored training and experience before achieving scientific independence. Most of these candidates were at Master's level with ambitions for doctoral training, with very few being doctoral candidates. The selected candidates also had to have a high level involvement in intensive research activities at their institutions. Early career scientists who were recommended by advisory board members or heads of their institutions were the focus of most of the IEARDA trainings. In addition, the trainees included participants from various specialties including grant support staff, regulatory and compliance officers, medical officers, and laboratory personnel. Later on, at the request of the IEARDA advisory board, some senior faculty and directors, who were not knowledgeable of US federal funding processes, or who needed refresher or update training, were also included in the training. These IEARDA trainings generated a demand that was beyond the initial plans and expectations because they were fairly short, interactive and very specific in nature. The increased demand for these trainings over the years kept them relevant to most of the researchers in other Ugandan institutions, and later, institutions across East Africa.

Utilization of Short-Term Practical Courses with Continuous Support

To meet the time limitations of the IEARDA trainees, trainings consisted of short sessions (of one half day to three days) and creatively targeted 20-30 researchers per class. The trainings mainly involved early career investigators and grant administration staff from the different partner institutions with similar training needs. All training sessions were conducted in English. These short-term trainings were designed to cover specific areas of grant writing and management based on the roles of the different staff that were targeted for attendance. The training materials were also compiled specific to trainees' roles and backgrounds. The topics covered for the short-term courses included on-line registration, electronic grant application processes, grant submission processes, budget development, finding funding opportunities and abstract preparation. These short-term courses were conducted with as much practical demonstration as possible to maximize understanding, participation and transfer of knowledge and practical skills.

The IEARDA trainings were designed to be very practical. Participants were encouraged to have computers during trainings and internet access was provided onsite. During grant-writing trainings, active funding opportunity announcements were presented and discussed. Trainers specifically conducted follow up support sessions to the trainees who were applying for the grants to ensure that they received continuous support and encouragement. This helped the early career scientists appreciate the rigors of applying for research grants within a supportive environment. A manuscript reporting these findings is under preparation.

Use of Existing and Visiting Mentors, Trainers and Specialists

The second step in the strategy was to use a pool of experienced administrators through the members of the IEARDA Secretariat, advisory board, and the collaborating teaching staff and

professors of MakCHS. The training and one-on-one mentoring was extended by utilizing visiting partners who included data base management experts, grant management specialists, regulatory and compliance officials, and finance officers as trainers and mentors. For example, one of the first IEARDA training workshops in 2007 was on accessing scientific databases. This workshop was conducted by Dr. Julia Royall from the National Library of Medicine at NIH who was in Uganda at MakCHS as a Fulbright fellow. The MakCHS Albert Cook Medical Library was the training site for this workshop, which ensured adequate use of the experienced library staff and the establishment of future collaborations with the library. Due to the high demand, a second previously unscheduled workshop on the same topic was organized and conducted before Dr. Royall left for the USA. IEARDA subsequently had several other trainers from various institutions in the USA, such as Johns Hopkins School of Public Health, Johns Hopkins School of Medicine, and the Case Western Reserve University, to name but a few. These facilitators covered a wide range of subjects ranging from grant writing to financial management and to abstract preparation. IEARDA also encouraged ongoing capacity building of its trainees through links with mentors. By tapping into this pool, costs were reduced, the benefits of the grant supported training were extended, and early career scientists were able to get continued access to mentorship support through these wider collaborative networks.

Providing Funding Opportunity Announcements (FOA)

The identification of funding opportunities was a required session for all the trainees. After each training, information such as trainee name, email address and job title would be added to the MU-JHU IEARDA listserv to disseminate funding opportunities. This provided trainees with strategically disseminated funding opportunity announcements that targeted upcoming researchers on a regular bi-weekly, then later, monthly basis. In addition to the general FOAs, the Training Coordinator would purposively select those FOAs considered relevant to early career scientists.

Documentation and Reporting

A training evaluation form based on Kirkpatrick's four-level model (Foreman, 2008) for the evaluation of training and learning was designed to be used for IEARDA training sessions. A database to capture information on IEARDA training was designed at the onset of the activities. Information captured about each training session was used to evaluate success and progress of the training activities. This information included evidence of the demand for trainings, regular communication and joint meetings with Office of Research Administration (ORA) staff and stakeholders, number of institutions registered with eRA Commons, number of grants submitted by IEARDA alumni, number of the projects completed through IEARDA, number of the support sessions conducted by the Secretariat to stakeholders and the number of persons receiving funding opportunity announcements. Trainees received certificates of successful completion of training after each session.

Outcomes

As indicated earlier in Strategy, there are seven key initiatives that were identified and followed up as measures for measuring success.

1. An increase in the numbers of Investigators conducting independent research and number of grants awarded.

There has been an increase in the number of research investigators and grants. Using MU-JHU as a case study, the number of local PIs increased from four in 2007 to 16 by the end of 2010. (See Table 1 and Figure 1 below). The number of awards increased from four in 2007 to 10 in 2010.

Award Years	Number of Grants	Number of PIs
2004	2	3
2005	2	3
2006	2	3
2007	3	4
2008	4	6
2009	7	10
2010	10	16

Table 1. The Number of Research Investigators and External Funding Sources at MU-JHU (2004- 2010)

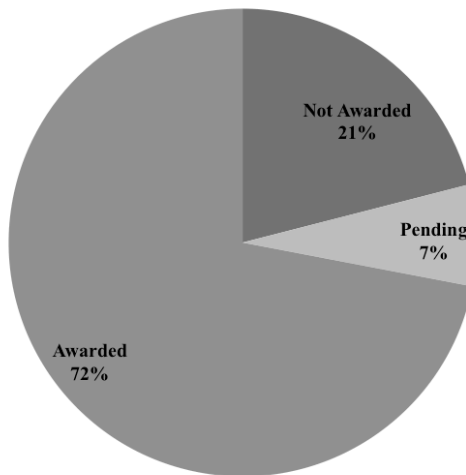


Figure 1. Grant Application Status for IEARDA Trainees as at end of 2010

2. Average cost of training per number of participants trained through MU-JHU Research Collaboration.

Overall, 309 participants from seven categories of both regionally and nationally distributed institutions attended the 15 short – term trainings arranged and conducted by MU-JHU IEARDA. About three trainings were conducted per year with each training meeting having about 25 – 30 participants and on average costing about \$20 per participant on each single day of the training (mainly to cover local transport re-imbusement and working teas). The most common and normally major costs of trainings in similar settings were defrayed due to exceptionally inventive approaches of vast institutional buy – in to accept cost – sharing, utilization of locally available space, internet and facilitators, purposive identification of trainees and trainings, as well as targeting local seasoned trainers and visiting specialists, among other means. Generally, with an annual budget of \$25,000 in direct costs for this grant, and compared to many similar training programs and their impact, the IEARDA Program at MU-JHU stands out among the most cost effective training programs whose approach is recommendable for application in highly collaborative but resource – limited settings.

3. Establishment of a Grant Management/Administration Office at each participating institution.

In 2007, at the start of the IEARDA Training Program Grant, only one of the five primary IEARDA stakeholder institutions had a grant administration office. The IEARDA trainings stimulated the establishment of a grant administration office at the remaining four institutions to support research development activities.

4. Degree of interest and participation in the training activities.

Participants' high interest was demonstrated by an almost 98% attendance and completion rate after receiving training session invitations. There was also high participation by women who accounted for more than 55% of the total number of the trainees. The post training evaluations also indicate that participants ranked highly the benefit gained from the trainings, as shown in Figure 2 below.

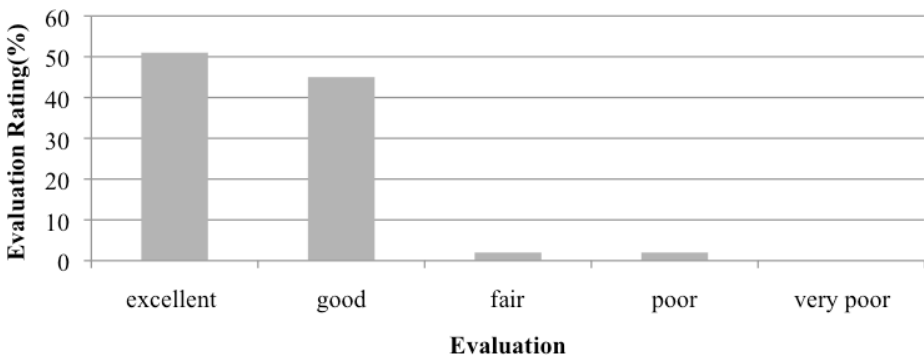


Figure 2. Overall Evaluation of IEARDA Training by the Participants

5. Providing sustained support for early career scientists.

The regular dissemination of funding opportunities is an effective model to follow up and provide continuous support to early career scientists. Currently, the IEARDA MU-JHU funding opportunity listserv has over 10,000 direct contacts from all over the world. The other strategy being used is matching the trainees with mentors, who are able to give continuous guidance and support to these early career scientists. Currently, there is a team of high level mentors identified globally through the IEARDA network and collaborative activities that offer support to emerging grant writers and authors.

6. Identification of Preference for short-term training vs. long-term trainings.

The result from the needs assessment questionnaire showed that over 76% of researchers and staffs are interested in short-term training. See Figure 3, below.

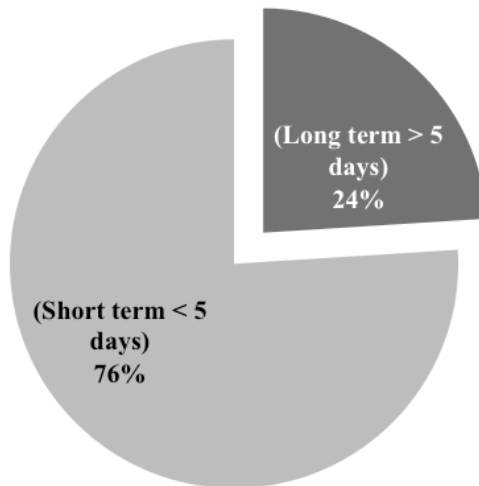


Figure 3. Percentage of Trainees Preferring Short-Term or Long-Term Training.

7. Expansion of Training Network.

The IEARDA grant writing and management training plans, including the short-term training sessions and monitoring and evaluation tools, have been adopted by other partners within Africa for their respective training programs. This training plan has also been used as a model for the grant writing and management trainings by other IEARDA grantees in Africa. The training agenda from this guide has been adopted and used in IEARDA and another NIH – funded program, called the Initiative on Research and Innovation Management (iRIM). The iRIM trainings that adopted this agenda format were conducted across the African continent at sites such as the Kenya Medical Research Institute, the Ibadan College of Medicine in Nigeria, with similar trainings held for different research institutions in Tanzania, Zambia, Senegal, and South Africa.

The successful IEARDA training grant outcome has given the affiliated institutions global exposure and improved regional networks through participation in the formation of platforms focused on enhancing research administration. Such newly formed networks include international grant writing, grant management and research administration associations and networks that often share information and lead to sources of funding for early career researchers. For example, the PI and the Training Coordinator have been involved in the formation of the Association of Research Administrators in Africa (ARAA). They have also been able to present at local and international meetings such as the International Network of Research Management Societies (INORMS), Association of Research Administrators in Africa (ARAA), the Society for Research Administrators International (SRA) and the Southern African Research and Innovation Management Association (SARIMA)

Conclusion

Most of the focus on development of early career scientists has been historically placed on long-term trainings at master's or doctoral levels in specialized areas like Epidemiology and Biostatistics. However, this IEARDA grant demonstrates that the career development of an early stage investigator is not completed until the long-term trainees are supported at their home institution through short-term courses designed to provide them with the tools, experience and mentors to become successful grantees. The grant demonstrates the need to use short-term, innovative, career focused, cost effective, and practical skill-building training as a way to fully develop the Investigator especially since most of these trainings were demand driven. This is supported by Donald Kirkpatrick's Four Level Evaluation Model, which states that when a learner goes through a learning process, the learner has to make a decision as to whether s/he will pay attention to it based on the overall interest, importance and relevance of the task. If the goal or task is judged as important and doable, then the learner is normally motivated to engage in it (Markus, Ruvolo, 1990). However, if the task is presented as low-relevance or there is a low probability of success, then a negative effect is generated and the motivation for task engagement is low. The IEARDA practical learning short courses were also relevant based on the Cognitive Learning Theory advanced by Gestalt psychologists which supports the notion that learning best takes place when humans generate short packaged pieces of knowledge that supports meaning through sequential development of an individual's cognitive abilities, such as the mental processes to recognize, recall, analyze, reflect, apply, create, understand, and evaluate (Fischer and Kurt 1980).

Capacity building and training activities specifically for upcoming researchers do not have to be a costly project. Successful results can be generated if the right groups of trainees are targeted, with the right information synthesized for the target participants. Dietrich et al (2004) as cited in (Walden 2007) state that economic profitability is an essential prerequisite for institutional training and that if a company training is viewed from an economic perspective, the company has incentives to provide training only if the total benefits gained from training exceed the costs arising.

To a large degree early career scientists in research intensive institutions in the developing countries are a highly dynamic group. They are involved in several operational activities and short-term courses which act as a catalyst for their abilities to apply for grants that are of interest to them. Malcolm Knowles, a practitioner and theorist of adult education, states that ‘adult students become ready to learn when they experience a need to learn in order to cope with real-life tasks or problems’ (Knowles, 1980 p 44, as cited in Fidishun, 2000). The IEARDA hands-on short-term trainings provide a great learning approach and opportunity for the early career investigators to identify what they needed to learn, as well as to assess themselves early on, network with others and create a supporting environment to promote their learning goals.

Such short- term trainings, if well designed, create a significant multiplier effect in institutions bringing with it well- intentioned collaborations and partnerships that benefit both the individual and the institution. In addition, research capacity building for early career investigators requires follow-up monitoring and support as key components to maintain the zeal and sustain the practical skills gained in the training activities.

Capturing and storing data throughout the program is a key component for any training grant. This is critical for it provides the basis of appreciating the successes and challenges of the program. There is also a need to develop monitoring and evaluation tools which will help to identify the indicators of success, achievements and challenges. The NIH reporting requirements for training programs also stress the need to ensure data and information on the trainings conducted is stated in enough detail to show both the relevance and impact. This has been a major highlight of many of the capacity building grants offered by the Institute. Therefore, PIs should clearly identify measures and training components that address specific competencies as well as capture data to assess that skills have been gained.

On the whole, the need to develop early career researchers has never been as critical as now, when established investigators are retiring or getting overwhelmed, and as the research demands of the modern era must be met. For resource- limited institutions, this training approach is one of the more feasible options for developing early career scientists at low cost. Training activities which are anchored on already well-established levels of cooperation across institutions can enable a highly collaborative design that utilizes established synergies for cost – effectiveness. This design is vital to the success of such a training strategy in low - resource settings; and it allows grant activities to be extended to more beneficiaries. For the MU-JHU IEARDA, such a model utilizing synergistic factors had enabled the extension of the beneficiaries to 23 institutions within a period of five years. As such, access to seed grants and the ability to utilize them innovatively can result in significant strides in the process of building the required skills and enhancing capacity to move science and research to the next level. To best utilize the small budget of the IEARDA grant, we designed highly customized, creative and demand driven collaborative training activities that would possibly make this a model capacity training grant in low – resource settings especially in Africa.

However, there are some limitations to the outcome measures. They were developed by a relatively small group of stakeholders at the beginning of this project, based on local needs. A

larger purposeful study involving several and differently designed training projects may need to be conducted to collaborate and substantiate some of these key findings. In addition, there are most likely other contributing factors impacting the results that cannot be solely attributed to training and follow-up methods used in this project. Likewise, there may be other direct benefits the IEARDA training activities have achieved that may not be identified due to data capturing limitations.

In conclusion, the IEARDA funding was able to offer short- term training and experience to new investigators and was instrumental in building the research administration capacity at Makerere University College of Health Sciences and its affiliates. The grant has also further strengthened the ability to disseminate funding opportunities, provided support for the submission of grant applications, and improved ongoing grant management capacity for grant awards.

Acknowledgements

The authors would like to thank the Advisory Board Members of the Office of Research Development (ORD), the ORD Secretariat, and the staff, trainees and the facilitators that have engaged with IEARDA at Makerere University-Johns Hopkins University (MU-JHU) throughout the five years of this grant. Our special thanks go to the support team at NIH, Dr. Regina James Smith and Dr. Jean Flagg-Newton; the MU-JHU Executive management, Dr. Mary Glenn Fowler and Dr. Philippa Musoke; and the support team at the MakCHS, Prof. Nelson Sewankambo, Prof. James Tumwine and Prof. Elly Katabira.

Authors' Note

This study was supported through the International Extramural Research Development Award (IEARDA), grant number GH11HD055871, from National Institute of Health (NIH) and National Institute of Child Health Development (NICHD). This article largely draws from the experiences from the implementation of the training activities on this grant. The content of this article is solely the responsibility of the authors and does not necessarily represent the official views of NIH or NICHD. The corresponding author is Henry Tumwijukye, Grants and Administration, Makerere University- Johns Hopkins University Research Collaboration, Box 23491, Kampala, Uganda., Tel/Fax 256 414 541044. Email:htumwijukye@mujhu.org.

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