



Shaping scholarly communication guidance channels to meet the research needs and skills of doctoral students at Kwame Nkrumah University of Science and Technology

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ABSTRACT

This article as part of a more comprehensive study, investigated the level of research and scholarly communication skills of doctoral students and the channels to be adopted by the academic library for the provision of scholarly communication guidance at Kwame Nkrumah University of Science and Technology (KNUST). It was ascertained that doctoral students at KNUST had moderate level of skill in research and scholarly communication issues; indicating the need for guidance. Both doctoral students and supervisors acknowledged the need for research and scholarly communication skills guidance and training. They also preferred online scholarly communication guidance and a research portal as part of the academic library website.

Introduction

The importance of research skills (Iwara, Mwale, & Simbarashe, 2018; Thompson et al., 2018) and publication skills (Cargill, Gao, Wang, & O'Connor, 2018) during postgraduate studies have been emphasised in literature. Campbell (2017) reported that an assumption on the part of faculty exist that all graduate students know how to do research; hence emphasis is not placed on the acquisition of research skills during supervision or included in doctoral curriculums (García-García, Ayuga-Téllez, González-García, & De Los Angeles Grande-Ortíz, 2014). On the other hand, it is expected of doctoral students to reflect the research quality and capacity of an institution (Spezi, 2016).

There are advocacies on early publishing by doctoral students (Horta & Santos, 2016; Bartkowski, Deem, & Ellison, 2015; Pickering & Byrne, 2014; Pinheiro, Melkers, & Youtie, 2014 and Larivière, 2012) but the necessary guidance to equip them have not been articulated in the literature. Kovalcikiene and Buksnyte-Marmiene (2015) as well as Miller, Hums, Turner, and Heere (2016) are of the view that doctoral studies open up the possibility for independent scientific research and for the development of future generations of highly qualified specialists. Thus, investment in doctoral students can be considered a major force to drive economic growth. This calls for guidance on the part of academic libraries to instil the necessary skills for research and scholarly communication.

Scholarly communication guidance should be seen as a core service

of academic libraries as they are mandated to support teaching, learning and research of parent institutions. For an academic library to effectively provide scholarly communication guidance to doctoral students, their level of research and scholarly communication skills must first be ascertained.

Scholarly communication is defined as “the creation, transformation, dissemination, and preservation of knowledge related to teaching, research, and scholarly endeavours” (Sauer, 2009). Guidance has been explained by Singh (2018) as a total programme of a number of highly specialised activities implemented to help individuals make wise, intelligent choices and decisions. No definition for scholarly communication guidance was found in literature, therefore combining the explanations for scholarly communication and guidance, scholarly communication guidance can be defined as providing training that equips users on scholarly communication practices such as the conduct of research study, research dissemination, copyright, data analysis, citation techniques and author requirements.

In 2010, the Association of College and Research Libraries identified scholarly communication as a top trend in academic librarianship due to the growth in open access/source products and locally-created digital collections, increasing complexity of licensing issues, and litigation around use of course reserves (Finlay, Tsou, & Sugimoto, 2015). Authors such as Howard (2008), Swoger, Brainard, and Hoffman (2015) as well as Thomas (2013) posit that technology has made a huge impact on the conduct, publishing, accessing, and promotion of research;

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archiving of data, and scholarly communication. In response, libraries have created or modified existing scholarly communication guidance to include amongst others, research portals (Finlay et al., 2015). Thomas (2013) divided scholarly communication guidance into outreach, educational and digital content services. Outreach and educational services include guidance on authors' rights and copyright while hosting and managing digital content involves providing an institutional repository, data management and digitization services.

Findings in this article are part of a doctoral study on scholarly communication guidance as a core service of the academic library to doctoral students. The findings presented in this article focus on the research skills of doctoral students and the channels of scholarly communication guidance by the academic library.

Brief background of Kwame Nkrumah University of Science and Technology

KNUST was officially opened on 22nd January 1952. It has six colleges consisting of departments, faculties and research centers. The colleges are Agriculture and Natural Resources, Art and Built Environment, Humanities and Social Sciences, Engineering, Health Sciences and Science.

The KNUST library system consists of the main university library, six college libraries and libraries in some departments and research centers (KNUST, 2005 Library Strategic Plan). The library subscribes to fifty (50) academic databases containing 30,000 online journals and more than 100,000,000 full text documents, bibliographic references, abstracts and book reviews (KNUST-Facts and Figures, 2015). KNUST Library was the first to host an institutional repository - known as KNUSTSpace - in Ghana (Corlety, 2011).

The role of the KNUST Library system is to select and acquire resources to build a comprehensive collection reflecting the goals and objectives of the university, to organize, preserve and make available relevant texts and documents to support the teaching, learning and research in science and technology for national development and to assist users in meeting their information needs (KNUST, 2015 Research Report).

Problem statement

The importance of research skills of postgraduate students and scholarly communication by doctoral students have been discussed extensively in literature (Carpenter, 2012; Catalano, 2013; Drachen, Larsen, Gullbekk, Westbye, & Lach, 2011; Drisko & Evans, 2018). The same cannot be said about investigations into doctoral students' research skills competence levels for the development of scholarly communication guidance by the academic library. This deficit and gap in literature cuts across the world at large and especially for Ghana. This article therefore ascertained the level of research and scholarly communication skills of doctoral students at KNUST as well as the channels to be adopted by the academic library for the provision of scholarly communication guidance.

This article is therefore guided by the following research questions:

1. What research skills do KNUST doctoral student possess?
2. Do doctoral students need scholarly communication guidance?
3. What forms of scholarly communication guidance channels do doctoral students prefer?

Significance of the study

The findings will supply academic librarians with insight into the research and scholarly skills required by doctoral students and enable them to establish tailor-made scholarly communication guidance. The findings will also serve as an educational platform for academic librarians, faculty members and postgraduate divisions on effective scholarly communication guidance to doctoral students.

Literature review

This section aims to identify connections, contradictions and gaps in the literature with reference to research and scholarly communication skills of doctoral students, need for scholarly communication guidance and forms of scholarly communication guidance by the academic library.

Doctoral studies

Kot and Hendel (2012) report that doctoral education – mainly in law, theology and medicine - emerged at universities in France, Germany, Great Britain and Italy in the twelfth century and spread to other countries in Europe and subsequently around the world. Such qualification allowed a scholar full membership of a guild. Founded on the British model, the Australian doctoral system is based on student-tutor relationships and is predominantly research based with assessment confined to the doctoral dissertation (Green & Macauley, 2007). Most doctoral students in the United States need to complete coursework, teach classes, pass qualifying examinations, conduct innovative research as well as submit and defend a dissertation based on original research (Green & Macauley, 2007; Louw & Muller, 2014; Tomaszewski, 2012).

Bao, Kehm, and Ma (2018) identified nine types of doctoral education including the research doctorate, the professional doctorate, the taught doctorate, PhD by published work, practice-based doctorate, the 'new route' doctorate, the model of the joint doctorate, the cooperative doctorate and the industrial doctorate, but in China, the main models are the professional doctorate, where the focus is on practice, which might generate a license to practice professionally (Lee, 2018) and the research doctorate.

The structure of the doctoral programmes at the University of Ghana includes a course work, comprehensive examination, seminar and thesis component. The coursework component is designed to ensure that students acquire academic and methodological training at the highest level including practical and interactive training (School of Graduate Studies, 2017, Handbook for Doctoral Studies). At KNUST, a doctoral candidate is required to "undertake original and significant research on an approved topic, the results of which are presented in a thesis. The research should make an original and significant contribution to knowledge or understanding" (Guide for preparation and evaluation of higher degree research supervision, KNUST, 2016).

Although doctoral education worldwide constitutes differences, some basic features have been identified. Requirements include contribution to knowledge through original research (Bao et al., 2018; Brodin, 2018; Lee, 2018; Nerad, 2010) extensive discipline specific knowledge (Coffman, Putman, Adkisson, Kriner, & Monaghan, 2016; Hancock & Walsh, 2016; Nerad, 2010) and mastering competencies of becoming a researcher (Hancock & Walsh, 2016; Li, 2016; Mantai, 2017).

Research and scholarly communication skills required

In the context of this study, research skill can be explained as the ability to identify the right research method for conducting research, to identify and access the right information needed for conducting research, to analyse data and the ability to determine the effective ways of disseminating research findings.

As an outcome of the requirements mentioned in the previous paragraph, it is generally expected of doctoral students doing research, to conduct efficient literature searches (O'Malley & Delwiche, 2012) as well as to exhibit proper scientific writing (Kahn, Conn, Pavlath, & Corbett, 2016). Ince, Hoadley, and Kirschner (2018) agree and indicate that these skills are needed to participate fully in scholarly communication and modern knowledge production.

Pinto, Fernández-Ramos, Sánchez, and Meneses (2013a) are of the

view that doctoral students require information literacy competence which entails the ability, skills and knowledge of analysing, synthesizing, evaluating, using and disseminating information to effectively address information needs. However, [Bussell, Hagman, Guder, and Guder \(2017\)](#) identify the foundational skill of choosing effective keywords as more important than advanced skills like finding and analysing data or dissemination research findings.

The results of a study highlighting an educational experience of two doctoral students in different doctoral programmes, was reported by [García-García et al. \(2014\)](#). The authors identified similar research and scholarly communication skills required by both institutions, namely search for solutions to real problems, the integration of knowledge, the ability to work in a team, formulating considered judgements, communicating conclusions and originality in presenting the results.

[Johnson, Kuglitsch, and Bresnahan \(2015\)](#) employed participatory and service design methods to identify emerging research needs and existing perceptions of library services amongst science and engineering post-graduate students and researchers at a satellite campus of the University of Colorado Boulder in the United States. The most important skills were identifying research already done successfully, formulating research problems and questions, employing correct research methods, analysing data, finding current literature and analysing data.

[Ince et al. \(2018\)](#) recommend digital fluency involving information communication technology skills to participate in global networks, conduct and share research, manage research workflow as well as to archive information.

Research and scholarly communication skill levels

A study by [Drisko and Evans \(2018\)](#) had faculty members rating doctoral students low on data collection methods, research designs, and data analysis techniques. Specific quantitative and qualitative research methods as well as preparation for publication were some of the lowest rated items.

[Critz et al. \(2012\)](#) posited that some graduate students overrate their information literacy skills. This is confirmed by [Pinto, Fernández-Ramos, Sánchez, and Meneses \(2013b\)](#) where doctoral students self-assessing their information competence, rated themselves as having high levels of competence, but acknowledging that it could be improved. Their responses to questions regarding research processes such as the selection of a research topic, the role of the dissertation director, the information systems available to students, or the competences necessary to carry out research showed self-perceptions of moderate competence. The authors concluded that the doctoral students had a considerably clearer vision of “why” they are going to conduct research compared to “how” they are going to accomplish it. [Murdoch-Eaton et al. \(2010\)](#) divided research skills into four main skill areas: research methods, information gathering, critical analysis as well as data reviewing and processing.

In summary, the research and scholarly communication skills required of doctoral students identified are information literacy competence ([Pinto et al., 2013a](#)), choosing effective keywords ([Bussell, Hagman, Guder, & Guder, 2017](#)), communicating conclusions and originality in presenting the results ([García-García et al., 2014](#)), formulating research questions and knowing which methods to use to answer them ([Johnson, Kuglitsch & Bresnahan, 2015](#)) and information communication technology skills ([Ince et al., 2018](#)).

Need for scholarly communication guidance

Both [Houghton \(2011\)](#) and [Davis-Kahl \(2012\)](#) confirmed the need for scholarly communication guidance due to, amongst others, an increased awareness and understanding of open access, author rights, increase in publications resulting in greater return of institutional investment of money, time, and resources to PhD students; an increase in the stock of useful knowledge; an increase in the supply of skilled

graduates and researchers; the creation of new scientific instrumentation and methodologies; the development of networks and stimulation of social interaction; the enhancement of problem solving capacity; the creation of new firms and the provision of social knowledge.

Effective scholarly communication guidance is capable of resolving issues associated with academic research distribution, ownership of ideas, depositing papers in institutional repositories and publishing in open access. Publications accessed easily lead to higher citing by other scholars, web visibility of both scholars and academic institutions resulting in heightened competitiveness and possible collaboration ([Ebrahim et al., 2014](#); [Oladokun, 2015](#); [Rao, 2009](#)).

Forms of scholarly communication guidance by the academic library

Academic libraries need to ensure that they are creating opportunities and tailoring their services to best meet the needs of doctoral students ([Bresnahan & Johnson, 2013](#); [Delaney & Bates, 2015](#)). A survey by [Bresnahan and Johnson \(2013\)](#) at University of Colorado Boulder in the United States showed that academic librarians preferred to guide their users through one-day workshops (74%), panels/presentations (68%), print handouts/guides (63%), informal discussions (63%), online tutorials (42%), one-on-one consultations (42%), webinars (32%), and multi-day workshops (26%). However, on a scale of 1 = most preferred and 5 = least preferred, doctoral students in a study by [Bussell, Hagman, and Guder \(2017\)](#) preferred guidance through a website (2.54), followed by an in-person workshop (2.66) and a video (2.76).

An aspect of a study by ([Fong, Wang, White, & Tipton, 2016](#)) sought to compare training formats preferred by masters and doctoral students. A total of 68% for both masters and doctoral students preferred in-person training taught by an instructor; online video/tutorial had 48% and 59% for masters and doctoral students respectively; webinar had 43% for masters and 40% for doctoral students; online information portal had 39% and 48% for masters and doctoral students respectively, small interest group received 25% each for both masters and doctoral students and lastly, online learning/research community receiving 20% for masters and 29% for doctoral students. These figures reflect the preference of online formats by doctoral students.

Capacity of academic librarians for scholarly communication guidance

[Thomas \(2013\)](#) opines that librarians themselves have to be familiar and conversant with all issues related to scholarly communication to be able to equip their users. Knowledge of copyright; publishing agreements such as archiving and embargo periods; open access; funder mandates and requirements; data curation as well as research support services must be basic competencies amongst academic librarians ([Baje, Yani, & Odigie, 2018](#); [Thomas, 2013](#)).

[Swoger et al. \(2015\)](#) also identified the need to expand training and education for academic librarians. Their study revealed that some librarians at a Public Liberal Arts College in New York, United States of America felt unsure when talking with faculty about issues such as self-archiving and open access. However, the study by [Baje et al. \(2018\)](#) involving 80 academic librarians from the Nigerian Library Association, showed that although academic librarians had high levels of knowledge on open access publishing platforms and copyright issues (88.75%) as well as current trends and assessment of scholarly resources (86.25%), knowledge levels of funder mandates (17.5%), data curation and management (31.25%) and the ability to liaise with publishers (18.75%) were low. In order for all academic librarians to possess the skills and knowledge needed to assist users, training to build capacity in offering scholarly communication guidance is needed.

In the view of [Whitmell \(2017\)](#), employers of library staff as well as library associations have major roles to play to make sure that academic librarians acquire the required skills and competence. [Baje et al. \(2018\)](#) agreed by suggesting that workshops, seminars and conferences should

be organized by library associations to build competencies and skills of members in scholarly communication issues. They also suggested the inclusion of scholarly communication issues in the curriculum of library schools. Haddow and Mamtora (2017) identified training initiatives for Australian academic librarians to include formal library education, seminars/workshops within the library, peer learning, in service training, self-training and external professional development. Academic libraries need to fund training initiatives offered professionally or invite experts to deliver training internally. Brown, Wolski, and Richardson (2015) opines that the background of the librarian and the details of the task to be performed need to be taken into consideration when training programmes are planned.

Methodology

A case study research design was adopted for the study, with KNUST as the research site. The study adopted the sequential type of mixed method approach involving the combination of qualitative and quantitative research and data (Creswell, 2014). Data was collected through separately designed web-based questionnaire responses from respectively KNUST doctoral students and doctoral supervisors as well as elicited through interviews with the dean of the School of Graduate Studies, professional librarians and the two deputy librarians within the KNUST library system.

Purposive sampling technique which involves the selection of the entire population that have a particular set of characteristics was adopted to select doctoral students and supervisors of doctoral students at KNUST.

Wilson's (1999) 1981 information behaviour model was adopted as a theoretical framework for better understanding of research skills of doctoral students.

Data collection and analysis

The student questionnaire was administered via student email addresses to all 699 doctoral students registered for the 2017/2018 academic year at KNUST, regardless of their year of first enrolment. To encourage participation, a bulk text message facilitated by the ICT services at KNUST with a link to the questionnaire was sent. After various reminders, one hundred and twenty-three (123) responses were received, constituting in a response rate of 17.9%. The web-based questionnaire was designed using google form and participants could answer them from their emails and submit. The data received from Google form was exported to Microsoft excel 2007 and subsequently exported to the Statistical Package for Social Sciences (SPSS) 21 for analyses. SPSS was used in generating frequencies and charts for the data analysis.

The questionnaire for supervisors was mailed to 215 academics supervising doctoral students registered for the 2017/2018 academic year. Due to low response rate, a printed version of the questionnaire was then provided for self-administration in their offices. After personal follow-ups, a total of 29 printed questionnaires were retrieved out of 60 delivered resulting in a response rate of 48%.

Face-to-face interviews were conducted with the dean of the School of Graduate Studies and the two deputy librarians representing the University Librarian. Responses were audio recorded. Ten professional academic librarians possessing postgraduate degrees in Library Science (Alemana, 2001) completed due to their busy schedules, printed interview questions at their own pace for later collection. Interview questions were both closed and open-ended.

Recorded interviews were transcribed and saved as individual Microsoft word files and later exported to AtlasTi, version 8. Keywords to be used as codes were generated based on the variables derived from the research questions, theory adopted for the study as well as other themes that arose from the interviews. In AtlasTi, selections of text and paragraphs were tagged and named with the predetermined codes.

Codes were then grouped under themes to facilitate the presentation of the data.

Presentation, interpretation and analysis of findings

The findings presented in this article focus on the research skills of doctoral students. Because of the low response rate, no generalizations were made.

Profile of respondents

The responses indicated that more males (82%) than females (18%) had enrolled for doctoral programmes. This trend corresponded to some extent with the ratio of 549:149 (3.69:1) registered. The majority of students were enrolled full-time (90%) and in the first year of their study (52%).

A comparison of the year of study of doctoral students within the colleges showed that with the exception of College of Engineering which had the highest number of students (40.9%) in year 3, all the other colleges had the highest number of students in year 1: College of Agriculture and Natural Resources (54.5%), College of Art and Built Environment (52.4%), College of Health Science (52.6%), College of Humanities and Social Sciences (64.3%) and College of Science (56.0%). On the other hand, registration statistics reflect that both the College of Engineering and College of Science had the majority of students in year 2. This is an indication that more year 1 students decided to respond to the questionnaires.

Level of skills

Doctoral students were presented with thirteen statements related to research skills needed and asked to assess their skills using the scale: no skill (1), low level of skill (2), moderate level of skill (3), high level of skill (4) and expert skill (5).

Fig. 1 presents the total group responses for each scale, while Fig. 2 presents the responses on the itemised statements.

Fig. 1 shows that more than a third of doctoral students (33.3%) indicated that they had moderate levels of skills, while 31.6% indicated high levels of skills, 9.3% expert skills, 19.9% low levels of skills and 6% no skills. The fact that 59.2% of students indicated no, low or moderate levels of skills is clearly a pointer to the need for the academic library to establish a scholarly communication guidance programme to effectively guide them.

A = Knowledge to access funding possibilities/grants for your research/doctoral studies.

B = Ability to access electronic resources available on the University library website.

C = Ability to access full text articles from the university library online databases.

D = Ability to use different referencing styles such as APA, Harvard, MLA, Chicago.

E = Knowledge to identify the right research design and methodology to address your research problem and answer your research questions.

F = Ability to use reference management tools such as Mendeley, Zotero, Refworks.

G = Ability to use data management software like SPSS, Excel, AtlasTi.

H = Ability to summarise your final thesis into a power point slide presentation.

I = Knowledge of preparing a manuscript for publication in a peer-reviewed journal.

J = Knowledge of preparing a manuscript for conference presentation.

K = Knowledge to determine where to publish your final research results.

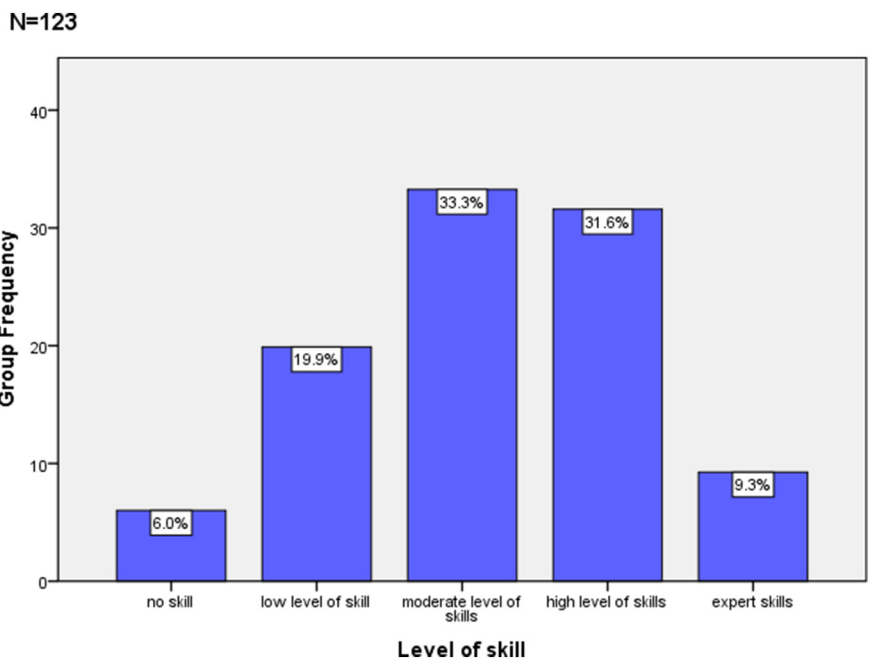


Fig. 1. Level of research skills of doctoral students (N = 123).

L = Knowledge on how to negotiate your right as an author.

M = Knowledge on how to determine journal impact factor.

The data in Fig. 2 is a confirmation that respondents have moderate level of skills. This is evident in seven of the thirteen listed activities. They are: *ability to use reference management tools such as Mendeley, Zotero, Refworks*(33%); *ability to use data management software like SPSS, Excel, AtlasTi* (43.9%); *knowledge of preparing a manuscript for publication in a peer-reviewed journal* (39%); *knowledge of preparing a manuscript for conference presentation* (38.2%); *knowledge on how to negotiate where to publish your final research results* (38.2%); *knowledge on how to negotiate your right as an author* (34.1%); and *knowledge on how to determine*

journal impact factor (35.8%).

Supervisors confirmed students having moderate level of skills in ten of the thirteen statements as well as low percentages for high or expert level of skills in eleven of the thirteen activities (Fig. 3):

A = How to access full text articles from the university library on-line databases.

B=How to use different referencing styles required for their research.

C=How to use reference management tools such as Mendeley, Zotero, Refworks.

D = How to access all the electronic resources available on the

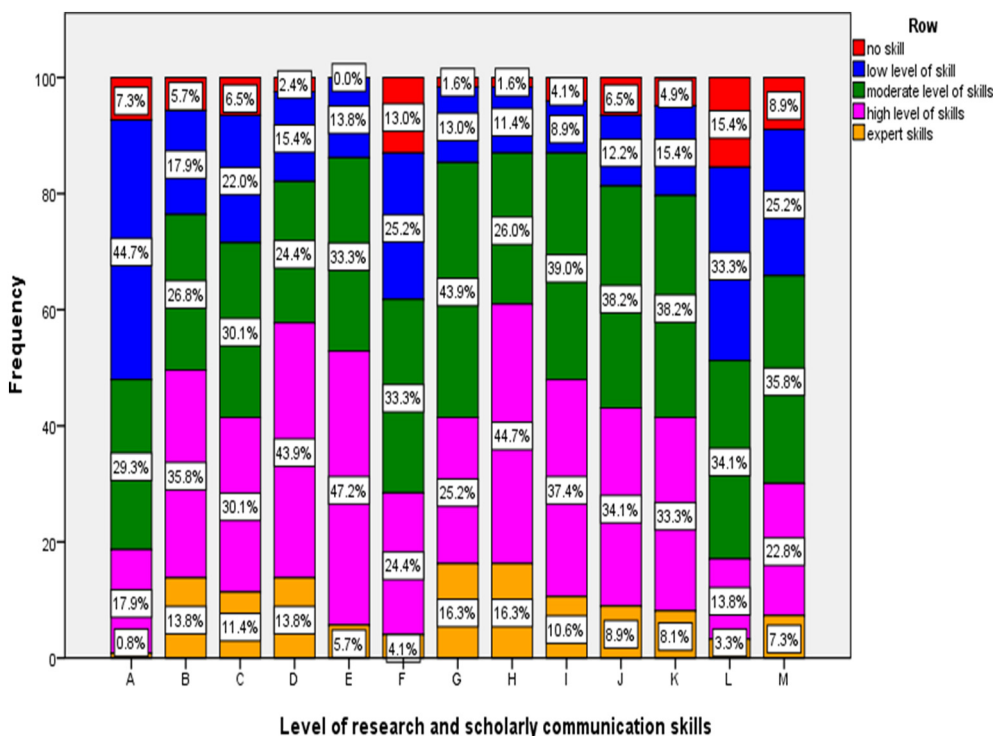


Fig. 2. Research skills of doctoral students (N = 123).

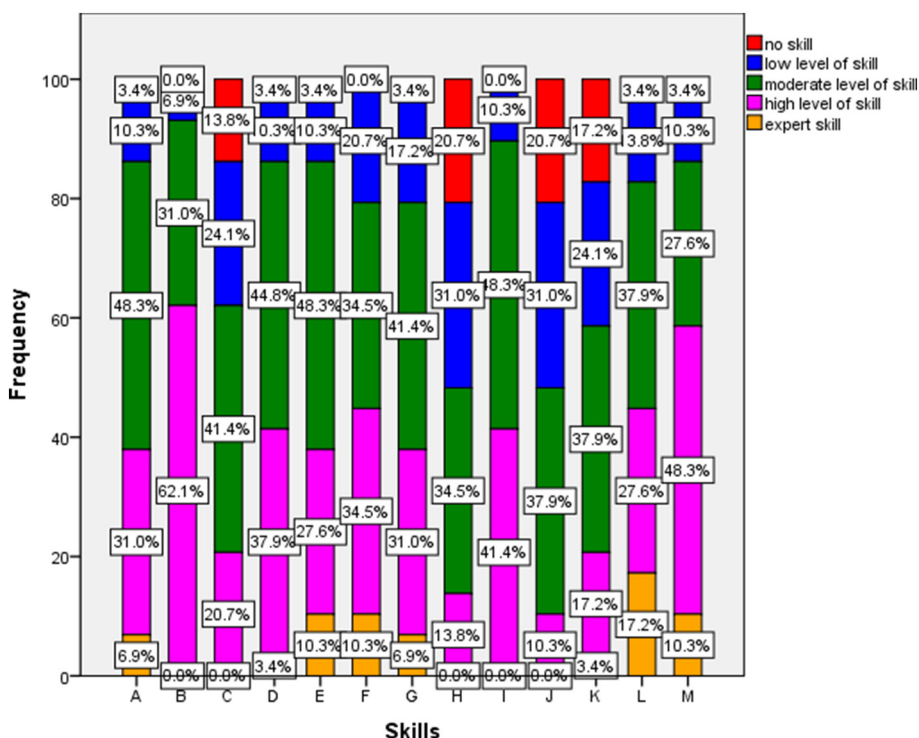


Fig. 3. Supervisors rating of doctoral students' skills (N = 29).

library website.

E = How to prepare a manuscript for publication in a peer-reviewed journal.

F = How to prepare a manuscript for a conference presentation.

G = How to determine where to publish their final research results.

H = How to access funding for their research or doctoral studies.

I = How to summarise the final thesis into a 15 power point slides for presentation.

J = How to negotiate one's right as an author.

K = How to determine journal impact factor.

L = How to use data management software like SPSS, Excel, AtlasTi or others.

M = How to identify the right research method to be used to answer the research questions.

The rating by the students corresponded with doctoral supervisors rating their doctoral students (Fig. 3) as having moderate level of skills in research and scholarly communication. However, students rated themselves higher compared to supervisors' ratings because supervisors identified ten activities in which students had moderate skill but the students rated themselves as having high level of skill in two of them. Thus, *how to access all the electronic resources available on the library website* (35.8%) and *how to summarise the final thesis into a 15 power point slides for presentation* (44.7%). This supports the assertion by Critz et al. (2012) that some graduate students lack information literacy and yet they overrate their information skills. It is also apparent that skills on especially the use of reference management tools such as Mendeley, Zotero, Refworks must be developed. Guidance regarding accessing funding possibilities or grants, how to negotiate rights as an author and how to determine journal impact factors are also needed and must be provided by the academic library through scholarly communication guidance activities.

The need for doctoral students to develop competencies of becoming researchers in their fields or areas of specialisation (Hancock & Walsh, 2016; Li, 2016; Mantai, 2017) indicates that it is very necessary for the academic library to ascertain their level of skills for the development of scholarly communication guidance. The literature reviewed in this article also shows that there are various types of doctoral

education (Bao et al., 2018; Green & Macauley, 2007; Lee, 2018; Louw & Muller, 2014; Tomaszewski, 2012) for which specialised skills for effective research and scholarly communication are required. A study by Drisko and Evans (2018) rating doctoral students low in data collection methods, research designs, and data analysis techniques is similar to the ratings by supervisors in this article.

Forms of scholarly communication guidance by the academic library

As outlined earlier in the literature review, there is a need for the academic library to offer scholarly communication guidance to doctoral students because in the views of Houghton (2011) and Davis-Kahl (2012), these will result in the creation of awareness and understanding of open access and the rights of authors; increase in publications from institutions and an increase in the supply of skilled graduates and researchers.

In order to establish an effective way to administer scholarly communication guidance, doctoral students were asked to rate how helpful some general interventions of scholarly communication guidance would be to them. The findings are presented in Fig. 4.

Face-to-face guidance with a professional librarian was indicated as very helpful (36.6%) and helpful (30.1%). Although 13.8% respondents saw *Online guidance on the academic library website* as very helpful, quite a high number of students (46.3%) rated it helpful. It might mean that although the website is helpful, they prefer other ways of scholarly communication guidance. *Information literacy workshops* drew as very helpful and helpful 35.0% and 37% respectively indicating workshops being perceived as an efficient form of scholarly communication guidance. However, a *research portal as part of the academic library website* was rated the most effective form with 43.9% and 35% of respondents rating it as very helpful and helpful respectively. This was quite insightful as the KNUST library did not have a research portal thus emphasising the need to establish a research portal as part of the academic library website for scholarly communication guidance.

Supervisors of doctoral students were also asked to rate the same list of general formats through which the academic library could offer scholarly communication guidance. Fig. 5 is a presentation of the

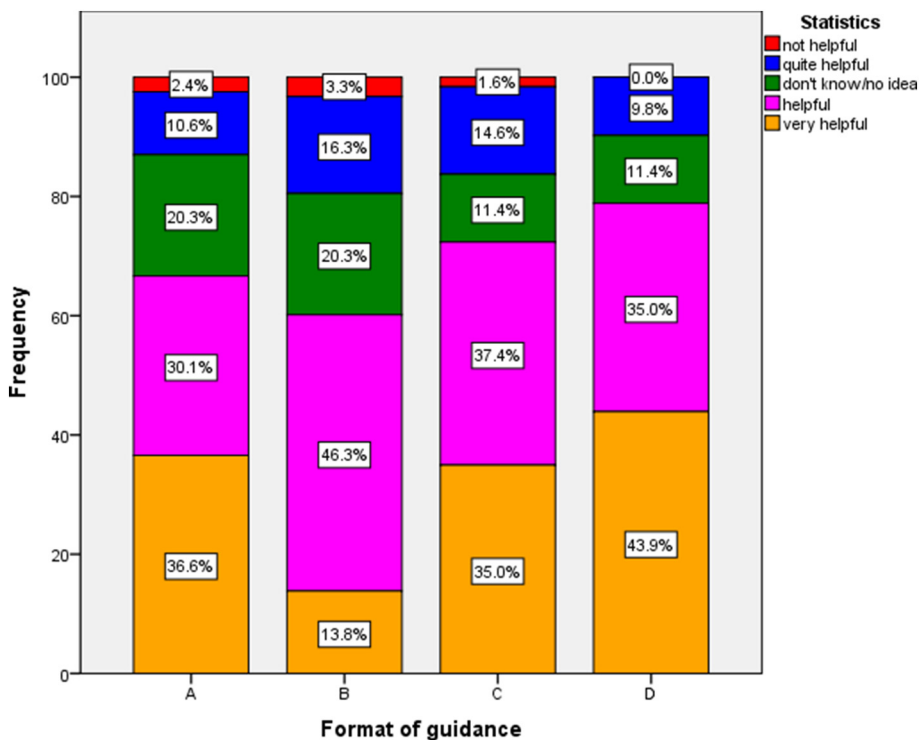


Fig. 4. General initiatives of scholarly communication guidance - students (N = 123).

- A = Face-to-face guidance with a professional librarian.
- B = Online guidance on the academic library website.
- C = Information literacy workshops.
- D = Research portal as part of the academic library website.

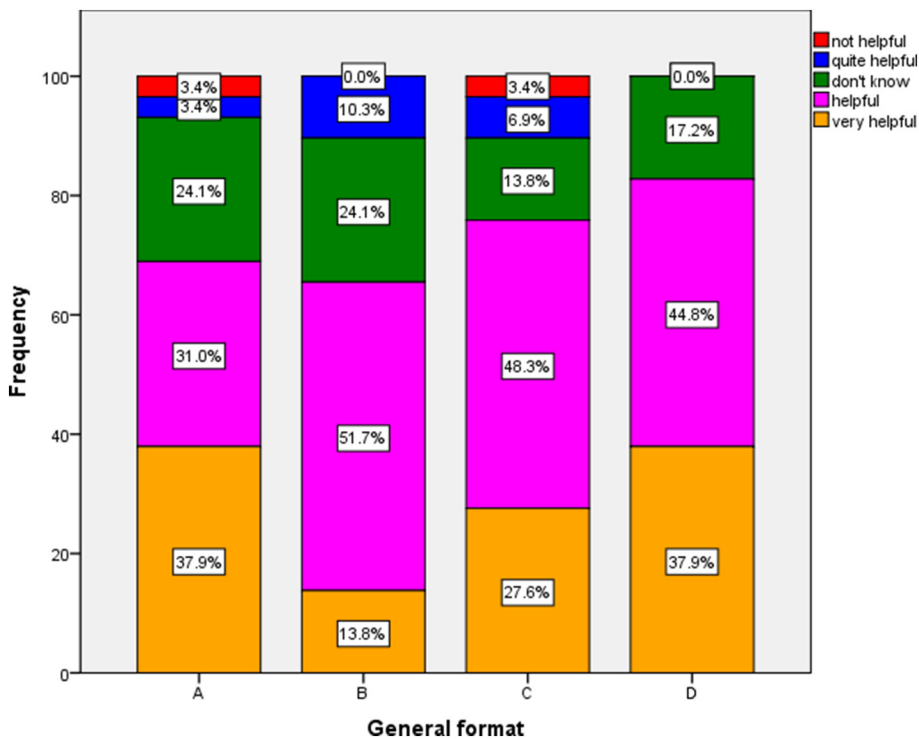


Fig. 5. General format of scholarly communication guidance – supervisors (N = 29).

- A = Face-to-face guidance with a professional librarian.
- B = Online guidance on the academic library website.
- C = Information literacy workshops.
- D = Research portal as part of the academic library website.

Table 1
Skills and expertise required of academic librarians for scholarly communication guidance

Theme	Interviewee	Responses
Subject librarianship	Deputy B	<i>If you are a librarian you must be abreast with your collection. Unfortunately, KNUST Library has not adopted this subject specialisation. That is the best way to deal with scholarly communication guidance.</i>
Information literacy	Deputy A	<i>For example, if you are in a medical science library and have to give the best guidance to somebody who is doing the PhD in medicine, you must be conversant with the collection. If we practice effective subject librarianship, there must be a librarian responsible for every subject area in the university. Then there will be effective scholarly communication guidance</i>
Scholarly communication issues	Deputy A	<i>The role of the librarian in this era has changed. It has moved from the practice of librarianship to being an information manager</i>
	PL 2	<i>The librarian should be able to understand the evolving models in scholarly communication. We used to have only print media now we have open access. The librarian should be able to communicate these models to doctoral students for effective scholarly communication guidance.</i>
	PL 8	<i>Should also be able to manage intellectual property issues</i>
	PL1, PL3, PL4, PL5, PL6, PL7, PL9 and PL10	<i>Academic librarians need to be very knowledgeable in scholarly communication issues in order to offer the necessary guidance</i>
Skills in academic writing	Deputy A	<i>Academic librarians need to be proactive in such matters.</i>
Information Technology Skills	Deputy A	<i>The ability to determine predatory journals</i>
	Deputy A	<i>Skills in identifying where to publish in each subject area in the university</i>
	Deputy A	<i>The academic librarian should be skillful in academic writing</i>
Web 2.0 Technologies	Deputy A	<i>Information technology skills and skills in the use of data management as well as reference management software is necessary</i>
	Deputy B	<i>Skills in web 2.0 technologies</i>
	Deputy B	<i>There have been workshops and training for staff recently in this areas because of the Building stronger universities (BSU) programme</i>

Table 2
Skills/capacity of academic librarians for scholarly communication guidance

Theme	Interviewee	Responses
Capacity of academic librarians	Deputy A	<i>Formally by the training, librarians were supposed to be curators, thus, people who take care of information and make them available. Because of that most of the librarians you may meet today, may not be part of the google generation so they need training to move with the change.</i>
	Deputy B	<i>Where they don't have the capacity, they are supposed to go through continuous professional training (CPDs) in order to ensure that they have the skills to meet the demands.</i>
	Deputy B	<i>It is the responsibility of every librarian to at least know the databases that the library has subscribed to, as well as the collections of the library.</i>
		<i>For web 2.0 tools, academic staff were recently trained so I believe they would be able to apply it.</i>

findings.

The findings presented in Fig. 5 indicate that doctoral supervisors regarded research portal as part of the academic library website (37.9%) as well as a face-to-face guidance with a professional librarian (37.9%) very helpful compared to online guidance on the academic library website (13.8%) and information literacy workshops (27.6%). The research portal as format for providing guidance were rated by the majority (82.7%) of supervisors as either helpful or very helpful.

Therefore, both doctoral students and their supervisors indicated that the establishment of a research portal as part of the academic library website for scholarly communication guidance would be very helpful. This is in agreement with a study by Buswell, Hagman, and Guder (2017) where doctoral students indicated preference for a website, followed by an in-person workshop and a video. In as much as the academic librarians in the study by Bresnahan and Johnson (2013) preferred to guide their users through one-day workshops, panels/presentations, print handouts/guides and informal discussions, this study is of the view that for the academic library to support their users effectively and meet their needs, their preferences and views for certain types of services should be taken into consideration.

Capacity of academic librarians for scholarly communication guidance

Information on the skills required of academic librarians to provide effective scholarly communication guidance was sought from the two

deputy librarians, professional librarians within the KNUST library system and the dean of the School of Graduate Studies. Deputy Librarians were labelled Deputy A and Deputy B, 'Dean' was used to label the dean of the School of Graduate Studies and the professional librarians were labelled PL1, PL2, PL3, PL4, PL5, PL6, PL7, PL8, PL9 and PL10. The responses were categorized according to themes identified and is presented in Table 1.

The required skill identified were *Information literacy skill* mentioned by Deputy A and the practice of *subject librarianship* identified by Deputy B. Being knowledgeable in *scholarly communication issues* was indicated by Deputy A, and all the professional librarians. Deputy A also identified *skills in academic writing* and *information technology skills*. Deputy A and Deputy B both mentioned *skills in Web 2.0 technologies*. These skills are in agreement with the ones outlined by Thomas (2013) and Baje et al. (2018) in the literature review, although they also identified copyright, publishing agreements such as archiving and embargo periods, open access, funder mandates and requirements, data curation, as well as research support services as basic skills needed.

The Deputy Librarians were further asked to indicate whether the professional librarians in the KNUST library system had the capacity for scholarly communication guidance. This was to ascertain their ability to guide doctoral students. The responses as recorded in the interviews are presented in Table 2.

Responses from the Deputy Librarians reflect the need for further training for academic librarians to be abreast with current trends in

Table 3
Professional librarians rating their capacity for scholarly communication guidance.

Scholarly communication issue	Respondents			
	No skill	Low level of skill	Moderate level of skill	High level of skill
Copyright issues		PL9, PL7	PL5, PL4	PL1, PL6, PL3, PL2
Open access publishing	PL9	PL7	PL8, PL5, PL3	PL1, PL6, PL2, PL10
Digitisation of documents	PL9, PL8	PL5	PL7, PL3, PL10	PL1, PL6, PL2
Plagiarism		PL5	PL9	PL7, PL6, PL3, PL2
Creative common licenses	PL9, PL8, PL3, PL2	PL5	PL1, PL6	PL10
How to determine journal impact factor	PL8, PL3	PL1, PL9, PL7, PL2	PL4	PL6, PL10
How to use different referencing styles required for research and publication		PL1, PL9, PL6	PL1	PL7, PL8, PL5, PL6, PL3, PL2, PL10
How to use reference management tools such as Mendeley, Zotero and Refworks		PL9, PL8, PL6, PL2		PL7, PL8, PL5, PL3, PL10
How to use data management software like SPSS, Excel, AtlasTi	PL5, PL3		PL7, PL10	
				PL8, PL10
				PL4
				PL4
				PL1, PL8, PL4, PL10
				PL4

scholarly communication issues. The need to expand training and education for academic librarians was also identified by Swoger et al. (2015) in the United States of America and Baje et al. (2018) in Nigeria. There is therefore an indication that academic librarians internationally, in general, need regular training to be equipped in scholarly communication issues and to improve capacity to provide expert scholarly communication guidance. The suggestion by Whitmell (2017) that employers of library staff as well as library associations have major roles to play indicates that many of the training programmes could be organised by library associations in conjunction with the employers.

The professional librarians were asked to rate themselves on their level of skills and ability to train doctoral students on the scholarly communication issues of copyright, open access publishing, digitization, plagiarism, creative common licenses, determining journal impact factor, different referencing styles, use of reference management tools such as Mendeley, Zotero and Refworks as well as use of data management software like SPSS and Excel. The rating scales were *no skill (scale of 1), low level of skill (scale of 2), moderate level of skill (scale of 3), high level of skill (scale of 4) and expert skill (scale of 5)*. Table 3 is a presentation of their responses.

Table 3 reflects variation in ratings of skills. The majority of professional librarians rated themselves to have some level of skill and capacity in issues such as copyright, open access, plagiarism and the use of different referencing styles. For example, four respondents (PL1, PL6, PL3 and PL2) had high level of skill while two (PL8 and PL10) had expert skills in copyright issues. On the other hand, two (PL9 and PL7) and two other (PL5 and PL4) librarians had low and moderate levels of skills respectively.

However, the majority are not familiar with creative common licenses, the use of data management tools, the use of reference management tools and digitisation which are knowledge critically needed in the conduct of research and dissemination of findings.

These findings are in line with the submission by Baje et al. (2018) that academic librarians in Nigeria had high knowledge on open access publishing platforms, copyright issues as well as current trends and assessment of scholarly resources but minimal knowledge in liaising with publishers as well as in data curation and management. Findings also correspond with Swoger et al. (2015) reporting that some librarians felt unsure when talking about issues such as self-archiving. These ratings call for additional capacity training initiatives for professional librarians at KNUST, perhaps in the form of workshops as mentioned by both Deputy B, Haddow and Mamtora (2017) as well as Baje et al. (2018).

Conclusions

This article discussed the research and scholarly communication skills of doctoral students at KNUST.

It was discovered that doctoral students had moderate levels of research and scholarly communication skills which was confirmed by doctoral supervisors. This challenge reflected in their responses to their skills in research and scholarly communication issues and tools. In view of this, the study argued that doctoral students require guidance and training to acquire and develop skills in research, dissemination of research (scholarly communication skills).

In order to ascertain appropriate methods/approaches the academic library can use to address the challenge at hand, responses from both doctoral students and supervisors indicated that they prefer online scholarly communication guidance and a research portal as part of the academic library website. In their view, the online ways of presenting scholarly communication guidance (a research portal as part of the academic library website) should complement workshops and face-to-face guidance mostly offered by academic librarians. Thus, every issue discussed through these means should be replicated in the portal. This is because the academic library exists to serve these patrons.

Although the study revealed that academic librarians had some level

of skills in some scholarly communication issues, additional capacity training initiatives to provide effective guidance is recommended. Workshops, seminars, conferences, self-training, external professional development with funds from the library and peer learning/on the job training have been identified as ways through which academic librarians can be trained to boost their capacity for effective scholarly communication guidance.

Recommendations

The academic library should determine the research needs and skills of doctoral students on a regular basis in order to adapt, update and develop scholarly communication guidance accordingly. This initiative should be seen as an outreach to students and be done every academic year at the beginning of each semester.

The feasibility of subject librarianship in order to supply discipline orientated scholarly communication guidance should be investigated by the KNUST library. Alternatively, academic librarians should be trained to provide such services irrespective of the department they find themselves.

As preference for online guidance were indicated by both doctoral students and supervisors, it is recommended that a research portal be established.

Declarations of competing interest

None.

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