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Original Article

Individual Factors and Micro-Environment as Predictors of Research Skills of Female Doctoral Students at Makerere University

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Keywords:

*Female Doctoral Students,
Leech's Model,
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Research Skills.*

Leech (2012) put forward a model with four predictors which explain who a knowledgeable and skilled researcher is. Based on Leech's model, the study aimed to test whether two of them (the individual and micro environment) were predictors of the research skills of female doctoral students in Makerere University (Mak). From the model, two hypotheses (H1-H2) were developed. That is, H1, which postulated that Individual Factors (IF), and H2, which postulated that the Micro-Environment (ME), both positively predicted research skills (RS) of female doctoral students in Mak. RS was operationalised as Creativity (Cr) and Readiness to do Research and to Write (RRW) for publication. Similarly, the two predictors (IR & ME) had four constructs each. Taking a positivist approach, cross-sectional and correlation designs, data were collected from 57 female doctoral students who filled out a self-administered questionnaire. Data analysis involved computation of descriptive statistics, correlation and multiple linear regression (MLR). Results revealed that two of the constructs of IF (Thinking Style [TS]; & Self-Efficacy [SE]) were significant positive predictors of RS, against the constructs of Motivation (M) and Personality (P), which were not. One construct of ME (Supervisor [Sup]) was a significant positive predictor of RS, while three others (Culture of the Department on Graduate Education [CDE]; Other Faculty [OF & Peers [Pe]) were not. Thus, of the eight sub-hypotheses, three were supported, meaning that Leech's model only offered a fair explanation of RS in Mak. Thus, a call for further research to explore all the predictors as put forward by Leech's model in other contexts.

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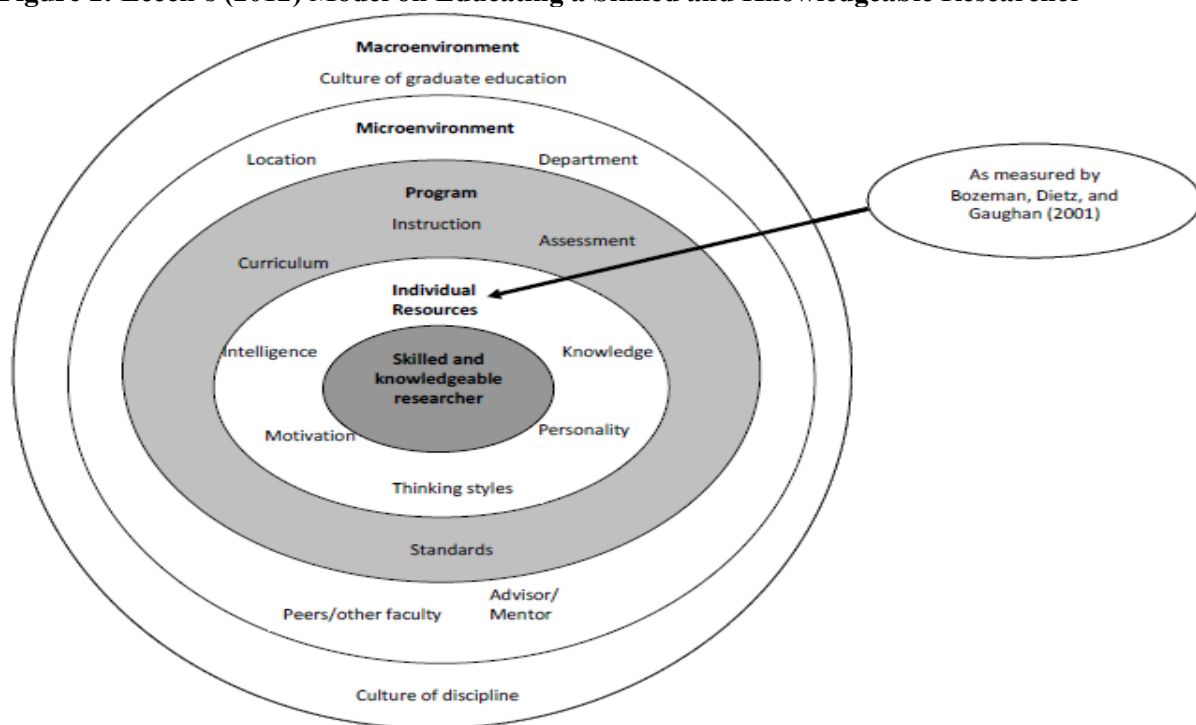
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INTRODUCTION

Leech (2012) suggested a model for training knowledgeable and skilled researchers, as in Figure 1.

Figure 1: Leech's (2012) Model on Educating a Skilled and Knowledgeable Researcher



(Source: Leech, 2012, p. 32, Figure 5)

Leech proposed four predictors of an individual's ability to become a skilled and knowledgeable researcher. The predictors are: individual resources, the program of study, the micro-environment, and the macro-environment. Leech explains that individual resources such as knowledge, personality, thinking style, motivation, and intelligence predict an individual's possibility to become a knowledgeable and skilled researcher.

The individual student is subjected to a program, which has a curriculum, the standards expected from the student; how the curriculum is to be instructed and assessed, which determines whether the student becomes a knowledgeable and skilled researcher. According to Leech, becoming a knowledgeable and skilled researcher is also predicted by the micro- and macro-environments in which the student studies. The more positive each

of these four predictors is, according to Leech, the higher the chances of a student transitioning into becoming a knowledgeable and skilled researcher.

Though Leech contributed a model which explains a skilled and knowledgeable researcher, the variables and constructs which make up a skilled and knowledgeable researcher remain unclear. Thus, through a literature search, the variables and constructs which make a skilled and knowledgeable researcher were identified. For example, Montuori (2005; 2008) and Montuori and Donneley (2013) describe a skilled researcher as one who is ready to explore the unknowns (creative). Lovitts (2005, 2008) also defined a skilled and knowledgeable researcher as one transitioning from being a student to an independent scholar, ready to write and engage in research. Yazdani and Shokooh (2018) associate doctorateness with being an independent scholar and having competencies in research, among other skills. Thus, from the literature, the main variable was defined as doctoral student research skills with constructs of creativity and readiness to read and write for publications.

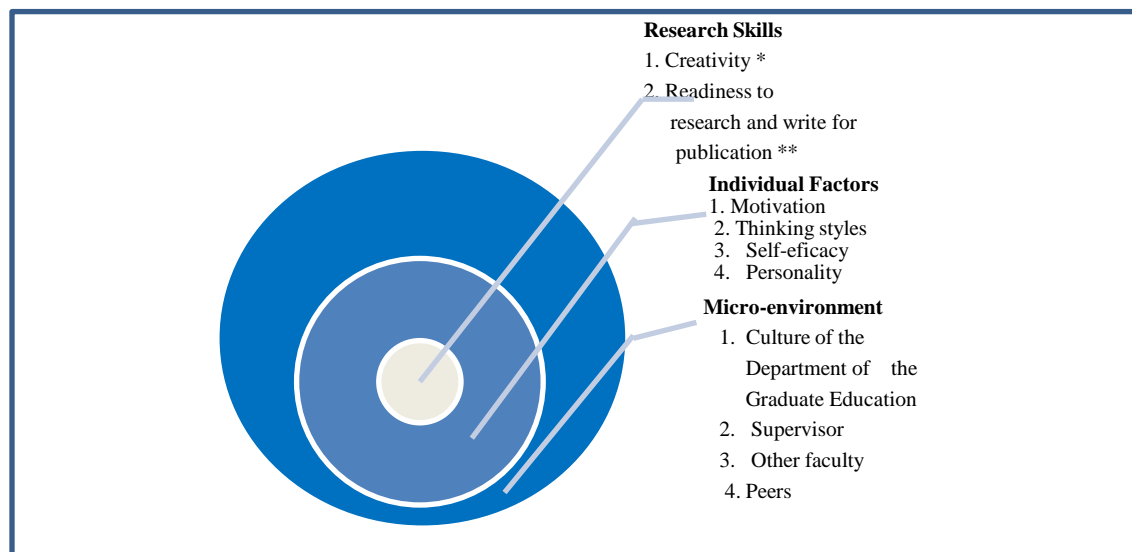
Leech's (2012) model provides a more comprehensive framework however, there has been limited evidence that the model has been empirically tested. It is true that some researchers (e.g., Leech, Crepeau-Hobson, Perkins, & Haug, 2015; Leech & Haug, 2015) used the model as the foundation for their studies on research methods of

graduate students in the United States, but they did not test the model. The two studies used the mixed methods research approach and descriptive statistics of frequency counts. However, apart from the two studies (Leech et al., 2015; Leech & Haug, 2015) being carried out in the context of the United States, they also did not carry out regression analysis to determine the level of prediction of these factors. Hence, the purpose of this study was to test whether the two predictors of Leech's model (i) individual resources (termed in this study as individual factors) and (ii) the micro environment, predicted female doctoral students' research skills in Makerere University.

CONCEPTUAL FRAMEWORK

Adapting Leech's (2012) model (Figure 1), the conceptual framework for the proposed study was as shown in Figure 2, with concepts adapted as indicated. The main concept of research skills (RS) in the centre of the figure was conceptualised as creativity, and readiness to do research and to write for publication. The independent variables, that is, predictors, were individual factors and the micro environment. The first predictor, namely a female doctoral student's resources, referred to motivation, personality, thinking styles and self-efficacy. The second predictor, a doctoral student's micro environment, was conceptualised as the culture of the department on the graduate education, supervisor, other faculty, and peers.

Figure 2: Conceptual Framework on Predictors of Female Doctoral Students' Research Skills



(Concepts based on * Montuori, 2005; 2008; *Montuori & Donneley, 2013; ** Leech, 2012; **Lovitts 2005; 2008; **Phillips & Pugh, 2010; **Yazdani & Shokooh, 2018).

LITERATURE REVIEW

Individual Factors and Research Skills

A literature review by Sverdlick et al. (2018) on what was termed as "a comprehensive" (p. 361) literature review of studies that had dealt with factors that influenced doctoral students' experiences in their programs was conducted. The review focused on some factors, such as motivation and the personal lives of students. Sverdlick et al. reviewed 163 articles that they obtained from ERIC, Psych INFO, Scopus, and Web of Science databases. They reported some internal factors, such as a student's motivation, that had affected doctoral students' experiences. They further reported that, of the studies they had reviewed, 50% had utilised qualitative methods, and only 18% and 29% had utilised mixed and quantitative methods, respectively. From this review, it was indicated that few positivist studies had been conducted on students' factors and their doctoral experiences. This implied that more positivist studies such as this one are needed. The studies also dealt with all students generally and did not particularly zero on female students.

Several studies (Kerrigan & Hayes, 2016; Lunyolo et al, 2019; Wamala & Ssembatya, 2013) have been carried out on how individual factors influence research skills or outputs of doctoral students. For example, Kerrigan and Hayes's (2016) study "explored the development of and relationship between doctoral students' interest in conducting research and their self-efficacy relating to research tasks over four research courses using previously collected assessment data from a research sequence in an Educational leadership doctoral program" (p.151). They aimed to test, among other hypotheses, whether there was a positive relationship between the interest of students enrolled with a doctorate in education and their research self-efficacy. They revealed that the self-efficacy of students enrolled with a doctorate in education had increased with each research course they had completed. As a gap, they reported that their study was based on a non-representative sample of students enrolled in a Doctorate of Education program in educational leadership and hence their findings could not be generalised.

Lunyolo et al (2019), in their study of predictors of successful doctoral completion (SDSC) in Makerere

University, where creativity and readiness to read and write were among the key constructs of SDSC, revealed that thinking style, self-efficacy and motivation were positive predictors, while personality was not. This was an indication that some individual factors predicted and others did not predict students' creativity and readiness to read and write. Wamala and Ssembatya (2013), in their study of scholarly productivity involving 534 doctoral holders in developing countries, using the Ugandan situation, indicated low scholarly productivity (29.2%) among doctoral holders. More notably, they revealed that there was no variation in productivity based on doctoral characteristics.

Huanga and Yang (2024), in their study of doctoral students' research motivation and outcomes in China, found that motivation has a significantly positive effect on research outcomes. As a gap, they recommended future research in various geographical contexts, which this study attempts to fill. Feng, Xie and Wu (2024) in their study of how personality is related to research performance of faculty in universities, aimed at examining the influences of researchers' personalities on their research performance within universities. Their study encompassed 189 faculty members from a university and employed descriptive statistics, correlation analysis, measurement, and structural equation modelling as the analytical procedures. The results specifically revealed that faculty members' personalities exhibited a negative correlation with research performance. From the literature, we note studies which supported that there is a significant relationship between individual factors and research skills, while others reported that there was no relationship between the two. Such contradictory findings prompted the need for this study. Thus, gaps in the literature warrant testing the hypothesis (H1) that Individual factors (IF) positively predicted female doctoral student research skills (RS).

Micro-environment Factors and Research Skills

Several systematic reviews (e.g., Boeren et al., 2015; Sverdlick et al, 2018) related to factors in the micro-environment and how they can influence research skills can be traced. Boeren et al. (2015), in particular, carried out a systematic review with the aim, among others, of getting the definition of mentoring [supervision] used in research and research methodologies. They reviewed papers on mentoring in the context of early career researchers who had less than 10 years of experience since the start of their PhD. They reviewed 23 published journal articles that had appeared in leading higher education journals in the ten years from 2005 to 2014. These journals included: *Journal of Higher Education*, *Research in Higher Education*, *Review of Higher Education and Studies in Higher Education*, *International Journal for Academic Development* and *International Journal for Researcher Development*. On the methodology employed, Boeren et al. (2015) reported that most studies had not been based on empirical data and that there had been a lack of theoretical frameworks emerging from studies on mentoring. Pertaining to the value of mentoring, Boeren et al. revealed that the studies they had reviewed had emphasised more positive than negative outcomes of mentoring for early career researchers. Thus, this empirical study, which is based on Leech's (2012) model, intends to close some of these gaps and verify whether mentorship/supervision produces positive or negative outcomes on the part of students.

Sverdlick et al. (2018) carried out what they termed as "a comprehensive review" (p. 361) of 163 studies that had dealt with factors that influenced doctoral students' experiences, that is, success, satisfaction, and well-being, in their programs. Using content analysis, they reported that factors which affected doctoral students' experiences had included what they termed "external factors" (pp. 369-375, 380), including those relating to supervision, departmental structures and socialisation. "The first - and often most influential - external factor that

affects doctoral students' experiences... is their relationship with their supervisor(s)" (p. 369). "Departmental structures are... a key component of the doctoral experience" (p. 372). "Researchers have... identified an association between departmental factors and doctoral student satisfaction and progress" (p. 373).

Empirical studies (e.g., Johnston et al., 2016; Nakanjako et al., 2014; Woolderink et al., 2015) related to research skills can also be cited. For example, Johnston et al. (2016) in their study used a locally developed survey instrument to elicit doctoral students' feedback. They used students' feedback to support developments in postgraduate supervision and support. They revealed that students had indicated the need for graduate programs to provide resources, which included supervisor training to enhance students' support; additionally, they revealed that students had reported the need to be integrated into the departmental culture, a supportive research environment which encouraged departmental seminars and colloquia presentations.

Nakanjako et al.'s (2014) study was an evaluation of doctoral training mentoring best practices at the College of Health Sciences, Makerere University in Uganda. They employed a qualitative approach involving two focus group discussions of 22 mentees and 12 mentors who had participated in a half-day workshop. The themes on which they collected data related to doctoral training experience. These included what had gone well, what had not gone well, solutions to challenges, and priority areas for improvement. They reported that mentors and mentees mentioned that the increasing number of doctoral students had provided an opportunity for peer mentorship among the aspects which had gone well in doctoral experience. They reported that mentees had challenges such as inadequate mentors who would support projects, limited office space for students and mentors, and inadequate communication skills. They revealed that participants had proposed skills training, an

induction course for both students and mentors, and continuous feedback evaluation to inform mentors' and mentees' experiences and expectations. However, they reported that their study had been limited to only the data they had collected during one workshop. Thus, this quantitative empirical study aimed at collecting data from various colleges in Makerere to evaluate the effect of doctoral students' mentors/supervisors on doctoral students' experiences, which include their research abilities.

Woolderink, et al. (2015) evaluated the relational aspects of PhD supervision. In particular, they explored the "expectations, experiences, and opinions of PhD candidates and supervisors regarding each other's role, thereby focusing on positive and negative contribution aspects" (p. 220). They used a website questionnaire consisting of both open and closed-ended questions and collected data from 54 PhD students and 52 supervisors of the Graduate School CAPHRI, Maastricht University in the Netherlands. Using thematic analysis, they found out "a good match between PhDs and supervisors is essential for a successful PhD trajectory" (218).

Other scholars (e.g., Kimanje & Lunyolo, 2022; Lunyolo et al, 2019) indicated how supervision particularly influenced students' research skills. For example, Kimanje and Lunyolo (2022) in their interpretive study on the PhD studentship and their research supervisors during the Covid-19 pandemic at a premier University in Uganda found out that inadequate supervisors' support affected students' writing skills. One of their respondents had this to say, "...my interaction with the supervisors had gaps Even when we met physically, we could not take a long time. Inability to meet my supervisor physically, almost killed my academic writing skills that were growing and lengthened the journey [research process]..." Lunyolo et al. 2019 in their study of predictors of successful doctoral completion in Makerere University, where creativity and readiness to read and write were among the key constructs, revealed that the

supervisor, other faculty were positive predictors, while culture of the discipline and peers were not. Such findings, which support and some contradictory findings, which do not support that the micro environment relates to the research skills or doctoral student experiences, necessitate this study to validate the results of these studies. Gaps in the literature warrant testing the hypothesis (H2) that The micro-environment (ME) positively predicted female doctoral student research skills (RS).

METHODOLOGY

Research Approach and Design

With a belief in objective ontology and epistemology that there is one reality and that knowledge can be measured, this study took a positivist approach. The study adopted cross-sectional and correlational research designs. The cross-sectional design was adopted because the study collected data on female doctoral students in Makerere University only once at that particular moment of investigation of female doctoral students' skills in research. Such a design allowed the collection of data by employing a self-administered questionnaire (Wang & Cheng, 2020). The correlational research design was used to determine relationships between the two predictors (individual factors and micro-environment) according to Leech's (2012) model and female doctoral students' skills in research (RS). Correlational design is appropriate for analysing quantitative data, and hence the computation of inferential statistics such as correlation and regression which was the basis for this study to determine the level of prediction.

Population and Sample

The study population involved 111 female doctoral students from the seven colleges in Makerere University who had graduated or were still in their doctoral program between 2009 and 2019 (Lunyolo, 2019, sampling frame of doctoral students from 1970 to 2019). The seven colleges were:

Agriculture and Environmental Sciences (CAES), Engineering Design, Art and Technology (CEDAT), Education and External Studies (CEES), Humanities and Social Sciences (CHUSS), Business and Management Science (COBAMS), Computing and Information Science (COCIS), and Natural Sciences (CONAS). Using the table for sample size determination by Krejcie and Morgan (1970), the appropriate sample size for this population comprised 86, who were selected using a simple random sampling strategy. However, only 57 (77%) female doctoral students responded to the self-administered questionnaire (SAQ). Some female doctoral students could not be traced because it was reported by some members in the colleges where data was collected that some were not working in foreign countries, and some had passed on.

Data Collection

A structured questionnaire with items adapted from already made instruments whose validity and reliability had already been established was physically distributed to a sample of female doctoral students from the selected colleges of Makerere University.

Instrument

Table 1 indicates the variables in the instrument, the constructs on each variable, the number of items on each construct, the source instrument of those items, and their reliability. As illustrated (in Table 1), the main variable (Research Skills [RS]) was operationalised in terms of two constructs, namely, creativity (Cr: 8 items) and readiness to research and to write for publication (RRW: 7 items). Altogether, there were 15 items measuring RS adapted from the given sources. Apart from RS, the instrument also contained 38 items for measuring the individual factors and micro-environment as predictors of RS, namely Individual Factors (IF: 18 items) and the Micro-Environment (MiE: 20 items). Each item was scaled using the five-point Likert scale from a

minimum of 1 (for very low or strongly disagree) to a maximum of 5 (for very high or strongly agree).

Table 1: Variables in the Instrument

Variable	Construct	Number of Items adapted	Sources of instruments, no of items and their reliabilities (α values)
Research Skills (RS)	Creativity (Cr)	8 (2, 3, 2, & 1 adapted from the respective sections)	Kumar & Holman (1997), 2 items on creative capacity ($\alpha = 0.76$), 17 items on belief in unconscious process ($\alpha = 0.70$), 18 items on use of techniques ($\alpha = 0.81$), 9 items on use of other people ($\alpha = 0.74$)
	Readiness to do research and to write (RRW)	7	Gilmore & Feldon (2010), 12 items ($\alpha = 0.84$)
Individual Resources (IR)	Motivation (M)	5	Chumbley, Haynes & Stofer (2015), 5 items ($\alpha = 0.89$)
	Personality (P)	5 (1, 3, & 1 adapted from the respective sections)	Schniederjans & Kim (2005), 4 items on Conscientiousness ($\alpha = 0.87$), 8 items on openness to experience ($\alpha = 0.83$), 3 items on emotional stability ($\alpha = 0.86$)
	Thinking styles (TS)	5 (1, 2, 1, & 1 adapted from the respective sections)	Black & McCoach (2008), 9 items on liberal/progressive ($\alpha = 0.863$), 6 items on external ($\alpha = 0.832$), 6 items on hierarchical ($\alpha = 0.767$), 5 items on judicial ($\alpha = 0.729$)
	Self-efficacy (SE)	3	Chumbley et al. (2015), 5 items ($\alpha = 0.83$)
Micro Environment (ME)	The culture of the department on graduate education (CDE)	5	Johnston, Sampson, Comer, & Brogt (2016), 7* items
	Supervisor (Sup)	7	Berk, Berg, Mortimer, Walton-Moses & Yeo (2005), 12 items ($\alpha = 0.97^{**}$)
	Other faculty (OF)	3	Chen & Lo (2012), 9 items ($\alpha = 0.93$)
	Peers (Pe)	5	Barnes, Chard, Wolfe, Stassen & Williams (2011), 5 items ($\alpha = 0.76$)

* No reliability (α value) reported; ** Reported in Chesnut, Siwatu, Young & Tong (2015, p. 405)

Data Analysis

The validity of multi-item constructs of RS and those of the predictors was tested using confirmatory factor analysis (CFA), and those of their reliabilities using the Cronbach's alpha method. Data was analysed at the descriptive and inferential levels, respectively. At the descriptive level, statistics such as percentages and means were computed, and at the inferential level, the comparative, correlational and multiple linear regression (MLR) statistics were run.

Ethical Consideration

Before the collection of data, I obtained an introductory letter from my college and permission was sought from each of the participating colleges where data was collected. Since it was quantitative research, the questionnaire also had an introductory page which clearly explained the purpose of the research and sought respondents' consent before filling out the questionnaire.

RESULTS

Demographic Characteristics

In terms of results, the sample was predominantly female students in the age bracket of less than 40 (54.7%), followed by those in the category of 40 but below 50 (37.7%), and the rest above 50 (7.5%). Most of the respondents (63.6%) were still on their doctoral programs by 2019, compared to those who had graduated from 2014 but before 2019 (27.3%) and those who had completed from 2009 but before 2014 (9.1%). In relation to colleges, our respondents came from eight colleges of the University, with the modal college being that of Education and External Studies [CEES], (25.0%); followed by the College of Computing and Information Science [COCIS], (16.1%) and then College of Humanities and Social Sciences [CHUSS], (14.3%). Other significant contributions to the sample came from the College

of Natural Sciences (CONAS) with 12.5%. Almost all (94.7%) respondents were Ugandans, and quite a big number (35.7%) were self-sponsored.

Descriptive Statistics

Student Research Skills

Research Skills (RS), the dependent variable was operationalised using two constructs, namely Creativity (Cr, seven items: $\alpha = 0.871$); and Readiness to do Research and to Write for publication (RRW, six items: $\alpha = 0.886$). Table 2 gives the means and ratings of the respective items of each construct of RS. According to Table 2, the constructs Cr and RRW had means of 4.04 and 4.04, respectively, which suggested that respondents rated themselves high on RS. This was confirmed by the mean = 4.04 of the overall average index (from the 13 valid items in Table 2).

Table 2: Means for the Constructs of RS

Construct	Item	Description	Mean	Rating
Creativity (Cr)*	Cr1	My PhD training (has) taught me to be engaged in creative type of work on a regular basis.	3.93	High
	Cr2	My PhD training (has) taught me that when I get a new idea, I have to get totally absorbed by it until I have pursued it completely	3.80	High
	Cr3	My PhD training (has) taught me to believe that creativity comes from hard work and persistence.	4.19	High
	Cr4	My PhD training (has) taught me to discover that creativity comes from careful planning and forethought.	4.11	High
	Cr5	My PhD training (has) taught me that to be creative, you need to practice.	3.98	High
	Cr6	My PhD training (has) taught me that in order to create new ideas, I have to combine existing ideas.	4.20	High
	Cr7	My PhD training (has) taught me that to come up with new ideas, I have to read widely.	4.54	High
	Overall		4.04	High
Readiness to Research and to Write (RRW)*	RRW1	PhD training (has) sharpened my critical thinking skills	4.25	High
	RRW2	PhD training (has) improved my organization skills	3.84	High
	RRW3	PhD training (has) enhanced my literature search to find information	4.30	High
	RRW5	PhD training (has) sharpened my oral communication skills.	3.91	High
	RRW6	PhD training (has) sharpened my research methodological skills.	4.05	High
	RRW7	PhD training (has) improved my ability to collaborate with others	3.88	High
	Overall		4.04	High

* Other items (Cr8 & RRW4) were invalid

Predictors of RS

The predictors of RS according to the conceptual framework (Figure 2) were the Individual Factors (IF) and the Micro-Environment (ME). Each of these predictors had constructs which were operationalised as shown in Figure 2. The respective constructs of IF scored the following reliabilities: Motivation (M: 5 items, $\alpha = 0.818$); Personality (P: 5 items, $\alpha = 0.778$); Thinking Style (TS: 5 items, $\alpha = 0.818$); and Self-Efficacy (SE: 3 items, $\alpha = 0.863$). These values suggest that all four constructs of IF had reliable items. The respective constructs of the Micro-Environment (ME) scored the following reliabilities: Culture of the Department on Graduate Education (CDE: 5 items, $\alpha = 0.876$); Supervision (Sup: 7 items, $\alpha = 0.927$); Other Faculty (OF: 3 items, $\alpha = 0.801$); and Peers (Pe: 5 items; $\alpha = 0.773$).

These values suggest that all four constructs of ME had reliable items.

Tables 3 and 4 give mean ratings of the respective constructs under a given predictor. According to Table 3, the means of the constructs under Individual Factors (IF) were as follows: M (Mean = 4.08); P (Mean = 4.00); TS (Mean = 3.76); and SE (Mean = 4.06). Thus, the respondents rated themselves high on each of the four constructs of IF. According to Table 4, the means of the constructs under the Micro-Environment (ME) were as follows: CDE (Mean = 2.74); Sup (Mean = 3.53); OF (Mean = 3.37); and Pe (Mean = 3.10). These means suggest that the respondents rated themselves high on the constructs Sup and OF, and only fair on the other three constructs (CDE, OF & Pe) of ME.

Table 3: Means for the Predictor Constructs of Individual Resources (IF)

Construct	Item	Description	Mean	Rating
Motivation (M)	M1	I found/find doctoral studies interesting.	4.12	Agreed
	M2	I enjoy(ed) my doctoral studies.	3.74	Agreed
	M3	I found/find doctoral studies relevant to my life.	4.18	Agreed
	M4	I was or I am curious about discoveries in my doctoral studies.	4.32	Agreed
	M5	Doctoral studies makes (made) my life meaningful.	4.21	Agreed
	Overall		4.08	Agreed
Personality (P)	P1	I was/I am hardworking when given a task in my doctoral studies	4.27	Agreed
	P2	I was/am imaginative in the way I work(ed) on my doctoral project	3.88	Agreed
	P3	I like(d) being original in my doctoral work	4.35	Agreed
	P4	I like(d) having a broad mind on the way I approach(ed) issues in my doctoral studies	4.20	Agreed
	P5	I could/can handle stress in my doctoral studies	3.35	Undecided
	Overall		4.00	Agreed
Thinking Styles (TS)	TS1	When faced with a problem in my doctoral studies, I prefer(ed) to try new strategies or methods to solve it.	3.77	Agreed
	TS2	I like(d) doctoral projects in which I could/can work together with others.	3.61	Agreed
	TS3	In my doctoral studies, when making a decision, I tried/try to take the opinions of others into account.	3.65	Agreed
	TS4	I like(d) to set priorities for the things I need(ed) to do in my doctoral studies before I start(ed) doing them.	4.04	Agreed
	TS5	I enjoy(ed) work that involved/involves analysing, grading, or comparing things in my doctoral studies.	3.72	Agreed
	Overall		3.76	Agreed
Self-efficacy (SE)	SE1	I was/I am able to do well in my doctoral studies.	3.96	Agreed
	SE2	I (have) gained the knowledge required of me as a doctoral student in my doctoral studies.	4.16	Agreed
	SE3	I (have) gained the skills required of me as a doctoral student in my doctoral studies.	3.95	Agreed
	Overall		4.06	Agreed

Table 4: Means for the Predictor Constructs of the Micro Environment (ME)

Construct	Item	Description	Mean	Rating
Culture of the Department on Graduate Education (CDE)	CDE1	My Department provided/provides me with sufficient access to computing facilities.	2.84	Undecided
	CDE2	The library facilities and services in my Department were/are sufficient for me to carry out my research.	2.81	Undecided
	CDE3	In my Department, I had/have sufficient access to financial support for my research activities.	2.36	Disagreed
	CDE4	My Department was/is a suitable workplace for me to conduct my doctoral research and write it up.	2.77	Undecided
	CDE5	I had/have appropriate level of support from technical and administrative staff in my department when needed.	3.06	Undecided
	Overall		2.74	Undecided
Supervisor (Sup)	Sup1	My doctoral supervisors demonstrate(d) professional integrity	3.75	Agreed
	Sup2	My doctoral supervisors demonstrate(d) content expertise in my area of need.	3.89	Agreed
	Sup3	My doctoral supervisors provide(d) constructive and useful critiques of my work.	3.56	Agreed
	Sup4	My doctoral supervisors were/are helpful in providing me direction and guidance on professional issues (e.g., networking).	3.38	undecided
	Sup5	My doctoral supervisors suggest(ed) resources which were/are appropriate for me in my doctoral program.	3.51	Agreed
	Sup6	My doctoral supervisors challenge(d) me to extend my abilities (e.g., risk taking, trying a new professional activity, and drafting a section of an article).	3.46	Agreed
	Sup7	I receive(d) timely feedback from my doctoral supervisors	3.12	Undecided
	Overall		3.53	Agreed
Other Faculty (OF)	OF1	I was/am respected by other faculty in my Department.	3.43	Undecided
	OF2	I had/have positive professional interactions with other faculty in my Department.	3.38	Undecided
	OF3	Other faculty in my Department encouraged/encourage my learning.	3.33	Undecided
	Overall		3.37	Undecided
Peers (Pe)	Pe1	Doctoral students in my program never compete(d) with one another for faculty time and attention.	3.36	Undecided
	Pe2	Experienced doctoral students in my program mentor(ed) me as a new student.	2.84	Undecided
	Pe3	Students in my doctoral program never complain(ed) of being exploited by the faculty.	3.25	Undecided
	Pe4	Students in my doctoral program had/have an active role in program decisions that affect(ed) us.	2.80	Undecided
	Pe5	Students in my doctoral program freely share(d) information with each other about how to get through the program.	3.44	Undecided
	Overall		3.10	Undecided

Comparative Analysis

To establish whether there were differences in levels of RS among female doctoral students of different backgrounds, tests of comparison were carried out using Analysis of Variance (ANOVA) and Student's t-test. The ANOVA results showed that on average, female doctoral students who were

in the age bracket of 50 but below 60 (mean = 4.25) scored highest on RS, followed by those in age of less than 40 (mean = 4.14), then those in age bracket of 40 but below 50 (mean = 4.08), and those of 60 and above (mean = 3.99) had the least RS. However, the computed or observed F ($F = 0.252$) was small given that its level of significance ($p = 0.778$) was larger than $\alpha = 0.05$ ($p > 0.05$). Thus, RS levels of

respondents did not differ significantly according to their ages when rounded to the nearest whole year. The results also showed that on average, female doctoral students who received their PhD in 2009 but before 2014 scored a mean of 4.06, and those who received their PhDs in 2014 but before 2019 and those who were to receive their PhDs in 2019 and after scored an equal mean of 4.02. However, computed or observed F ($F = 0.011$) was small given that its level of significance ($p = 0.989$) was larger than $\alpha = 0.05$ ($p > 0.05$). Thus, RS levels of respondents did not differ significantly with the time one received/may receive their PhD. When it came to the college female doctoral students studied from, CHS (mean = 4.50) scored highest on RS, followed by those from CEES (mean = 4.32), COBAMS (mean = 4.28), CAES (mean = 4.22), CEDAT (mean = 4.06), CHUSS (mean = 3.85), CONAS (mean = 3.67), and the least were those from COCIS (mean = 3.46). However, computed or observed F ($F = 2.161$) was large given that its level of significance ($p = 0.056$) was larger than $\alpha = 0.05$ ($p > 0.05$). Thus, RS levels of respondents did not differ significantly according to the colleges of study the female doctoral students belonged to. So the differences in means for the ANOVA results may be attributed to chance.

The Student's t Test results showed that on average, female doctoral students who were nationals (mean = 4.06) scored higher on RS than internationals (mean = 3.61). However, Student's t ($t = -1.536$) was small because its level of significance ($p = 0.238$) was larger than $\alpha = 0.05$ ($p > 0.05$). Thus, RS levels of national and international doctoral students did not differ significantly. The female doctoral students who were self-sponsored (mean = 4.17) scored higher on RS than those on scholarship (mean = 3.96). However, Student's t ($t = 0.960$) was small because its level of significance ($p = 0.344$) was larger than $\alpha = 0.05$ ($p > 0.05$). Thus, RS levels of self-sponsored doctoral students and those on scholarship did not differ significantly. So the differences in the students' t -test results may also be attributed to chance.

Correlation Analysis

To establish whether there was a relationship between the predictors, namely, Individual factors (IF) and the Micro-environment (ME) and female doctoral students' research skills (RS), a correlation analysis was carried out. Correlation analysis was carried out between the four constructs of IF namely; motivation(M), personality (P), thinking styles (TS), and self-efficacy (SE) respectively and four constructs of ME namely; culture of the department on graduate education (CDE), supervisor (Sup), other faculty (OF), and peers (Pe). The results suggest that all the four constructs of IF namely; motivation ($r = 0.000$), personality ($r = 0.000$), thinking styles ($r = 0.000$) and self-efficacy ($r = 0.000$) were significant positive correlates of RS ($p < 0.05$), with thinking styles (TS) correlating most significantly with RS, followed by self-efficacy (SE), personality (P), and motivation(M) respectively. Thus, at the preliminary level, all the sub-hypotheses H1.1-H1.4 were supported.

The results also suggest that two ME constructs, namely, supervisor ($r = 0.004$) and other faculty ($r = 0.036$), were significant positive correlates of RS ($p < 0.05$), with supervisor (Sup) correlating more than other faculty (OF). The constructs of culture of the department on graduate education (CDE) and peers (Pe) were not correlated with RS ($P > 0.05$). Thus, at the preliminary level, hypotheses H2.2 and H2.3 were supported, while H2.1 and H2.4 were not.

Regression Analysis

The multiple linear regression model was used to test the two hypotheses (H1-H2). Table 5 gives the pertinent results. On the first hypothesis (H1), the four constructs of Individual Factors (IF) explained 53.8% of the variation in RS (adjusted $R^2 = 0.538$). This means that the regression model was extremely good/significant ($F = 12.641$, $p = 0.001 < 0.05$). The significance levels (p -values) suggest that two factors, thinking styles (TS) and Self-Efficacy (SE), were the most significant predictors of RS.

Motivation (M) and Personality (P) did not predict RS. The magnitudes of the respective betas (β s) suggest that of the two significant constructs of RS, thinking styles (TS) was the most significant predictor of RS, followed by Self-Efficacy (SE).

On hypothesis (H2), the four constructs of the Micro-Environment (ME) explained almost 14.7%

of the variation in SDSC (adjusted $R^2 = 0.147$). This means that the regression model was good/significant ($F = 2.894$, $p = 0.034 < 0.05$). The significance levels (p -values) suggest that only the construct of Supervision (Sup) was a significant positive predictor of RS, while the other three (Culture of the Department on Graduate Education, CDE, Other Faculty, OF & Peers, Pe) were not.

Table 5: Results of the Multiple Linear Regression Models for Testing the Hypotheses

Hypothesis	Sub-hypothesis	Path	Measures of the goodness of the model	Standardised Coefficients, β , and p value)	Hypothesis supported?
H1	H1.1	M \rightarrow RS	Adj $R^2 = 0.538$	$\beta = 0.269$, $p = 0.071$	No
	H1.2	P \rightarrow RS	$F = 12.641$	$\beta = -0.091$, $p = 0.591$	No
	H1.3	TS \rightarrow RS	$p = 0.001$	$\beta = 0.391$, $p = 0.032$	Yes
	H1.4	SE \rightarrow RS		$\beta = 0.312$, $p = 0.042$	Yes
H2	H2.1	CDE \rightarrow RS	Adj $R^2 = 0.147$	$\beta = -0.015$, $p = 0.939$	No
	H2.2	Sup \rightarrow RS	$F = 2.894$	$\beta = 0.411$, $p = 0.028$	Yes
	H2.3	OF \rightarrow RS	$p = 0.034$	$\beta = 0.312$, $p = 0.067$	No
	H2.4	Pe \rightarrow RS		$\beta = -0.322$, $p = 0.094$	No

RS = Research Skills; M = Motivation; P = Personality; TS = Thinking Styles; SE = Self-Efficacy; CDE = Culture of the Department on Graduate Education; Sup = Supervisor; OF = Other Faculty; Pe = Peers.

DISCUSSION

Individual Resources as a Predictor of Research Skills

The first hypothesis (H1) postulated that individual factors positively predicted RS in Makerere University (Mak). This hypothesis was partially supported because two of the sub-hypotheses (motivation and personality) were not supported. This finding partially supports Leech's (2012) model. The sub-hypothesis of motivation not being a predictor of RS is contrary to the findings of the 244 studies in Fong and Kim's (2016) meta-analysis, to the effect that motivation was one of "the most influential predictors for both achievement and persistence outcomes" (p. 25). Though the negative finding suggests that Motivation (M) is not very important as far as RS of female students in Mak is concerned, the stakeholders (e.g., supervisors, Directorate of Research & Graduate Training [DRGT]) and other universities in Uganda and beyond should not completely ignore to enhance the motivation of

female doctoral students as it contributes to their RS to make sure that their studies are interesting, and enjoyable. The unexpected finding suggests that Personality (P) is not very important as far as RS in Mak is concerned. Thus, the stakeholders (e.g., supervisors, DRGT) responsible for SDSC in Mak need not put much emphasis on it when admitting, supervising or otherwise trying to enhance RS. However, such an unexpected finding might have been a result of dealing with one sex (female doctoral students) who might have had similar characteristics. This can be explored more by including male doctoral students.

Sub-hypotheses of thinking style (TS) and self-efficacy (SE) as positive predictors of RS were supported. This was in support of Leech's (2012) model. The finding on Self-Efficacy (SE) as a positive predictor of RS concurred with the 244 studies in Fong and Kim's (2016) meta-analysis to the effect that self-perception - another name for SE - was one of "the most influential predictors for both achievement and persistence outcomes" (p. 25). The

positive findings suggest that TS and SE are very important as far as RS was/is concerned. Thus, the stakeholders (e.g., supervisors, DRGT) in Mak and other universities in Uganda and outside need to enhance the TS and SE among female doctoral students as a means of enhancing RS. They may consider the teaching of critical thinking (Musisi & Taylor III, 2010) to students, encouraging students to try new strategies or methods to solve problems, and to have teamwork, among their activities.

Micro Environment as a Predictor of Research Skills

The second hypothesis (H₂) in the study postulated that the Micro-Environment (ME) is a positive predictor of RS in Makerere University (Mak). The hypothesis had four sub-hypotheses (H_{2.1}-H_{2.4}). Sub-hypothesis H_{2.1} (Culture of the Department on Graduate Education (CDE), Sub-hypothesis H_{2.3} Other Faculty (OF), and Sub-hypothesis H_{2.4} Peers (Pe)) were not supported as positive predictors of RS, which did not tally with Leech's (2012) model. The finding was unexpected because it was at variance with the 163 studies of Sverdlick et al.'s (2018) comprehensive review, which revealed that factors that had affected doctoral students' experiences related to departmental structures, other faculty and peers. Nevertheless, our unexpected finding suggests that CDE is not very important as far as SDSC in Mak is concerned. Thus, the stakeholders (e.g., supervisors, DRGT) need not put much emphasis on CDE when trying to enhance the RS of female doctoral students. Though the finding on OF was not supported, stakeholders should ensure that other faculty do not neglect female doctoral students. They should endeavour to have professional interactions with them and encourage their learning. Also, though not important, the stakeholders (e.g., supervisors, DRGT) need not completely ignore organising opportunities where students could learn from their peers, for example, doctoral colloquiums, seminars, among others.

Sub-hypothesis H_{2.2}, which postulated that Supervision (Sup) was a positive predictor of RS,

was supported, which in turn, was in support of Leech's (2012) model. The findings concurred with the 163 studies, which were the basis on which Sverdlick et al.'s (2018) comprehensive review concluded that factors which had affected doctoral students' experiences included what they termed "external factors" (pp. 369-375, 380). The "external factors" included those relating to supervision. The positive finding suggests that Supervision (Sup) is very important, indeed, the most important, based on the beta values - as far as RS in Mak is concerned. Thus, the stakeholders (e.g., supervisors, DRGT) responsible for SDSC in Mak and other universities need to enhance the Supervision (Sup) of the doctoral students as a means of enhancing SDSC; the stakeholders should ensure that the doctoral supervisors demonstrate professional integrity; content expertise in a given student's area; provide constructive and useful critiques of students' work; provide direction and guidance to students on professional issues (e.g., networking); suggest resources useful for students; challenge students to extend their abilities; and give timely feedback to the doctoral students.

CONCLUSION

Leech's model (Figure 1) was adapted to explore how the Individual Factors (IF) and the Micro-Environment (ME) predicted female doctoral students' research skills (RS) in Makerere University (Mak). Based on the conceptual framework (Figure 2), two hypotheses (H₁-H₂), Individual Factors (IF), and the Micro-Environment (ME) were tested to determine if they positively predicted RS. The main variable (RS) and two predictors (IF & ME) had constructs. Using multiple linear regression (MLR), it was revealed that the individual factors partly predicted the research skills of female doctoral students at Makerere University. The constructs of Thinking Style (TS) and Self-Efficacy (SE) were significant positive predictors of RS, while the constructs of Motivation (M) and Personality (P) were not. It was further revealed that the micro environment largely did not predict the

research skills of female doctoral students at Makerere University. Only one construct of ME (Supervisor [Sup]) was a significant positive predictor of RS, while three others, Culture of the Department on Graduate Education (CDE), Other Faculty (OF) and Peers (Pe), were not. Thus, of the eight sub-hypotheses, three were supported, meaning that Leech's model (Figure 1) was only a fair explanation of the RS of female doctoral students in Makerere.

LIMITATIONS AND FURTHER RESEARCH

The study focused only on two predictors as per the Leech (2012) model and did not explore all four predictors. Thus, further researchers can continue to test Leech's (2012) model by exploring all four factors (individual, program, micro and macro environmental factors) in other contexts, paying attention to parts of the model that were not supported. Another basis for calling for more studies is that the study involved a small sample of 57 female doctoral students, meaning that future researchers should use larger samples. The study was predominantly positivists, further research can consider using interpretivist or pragmatic research approaches to gain more insight about female doctoral students' experiences. All the same, the study was significant in that it pioneered the positivist testing of Leech's model, particularly on female doctoral students.

RECOMMENDATIONS

It is recommended that female doctoral students work hard to enhance their thinking and self-efficacy characteristics to improve their research skills, while not ignoring motivation and personality, since they contribute a lot to enhancing their research skills. The supervisors and especially those in departments where these students study in Mak should give tasks which are thought-provoking, call for more hands-on or practice to enhance students' thinking and self-efficacy. Makerere and other similar universities could strengthen their assessment guidelines or policies

which promote hands-on practice to enhance students' learning competencies.

The supervisors and DRGT should provide an environment which is supportive enough to enhance students' research skills. Though the culture of the department on graduate education, other faculty and peers were found not so important in predicting research skills of students, there should be an attempt by the university to improve on this environment and create collaborative supervisor and student teams to supplement what supervisors offer. The University should ensure that supervisors are supported by other faculty and are continuously trained so as to have enough expertise to offer effective supervision to students in terms of mentorship, giving feedback, among others. Makerere and other similar universities could set up or strengthen their supervision guidelines or policies to ensure that supervisors effectively supervise students to enhance their research skills.

REFERENCES

- Barnes, B. J., Chard, L. A., Wolfe, E. W., & Stassen, M. L. A. (2011). An evaluation of the psychometric properties of the graduate advising survey for doctoral students. *International Journal of Doctoral Studies*, 6, 1-17. Retrieved from <https://www.umass.edu/highered/sites/default/files/cv/williams-CV.pdf>
- Berk, A. R., Berg, J., Mortimer, R., Walton-Moses, B., & Yeo, T. P. (2008). Measuring the effectiveness of faculty mentoring relationships. *Academic Medicine*, 80(1), 66-71. Retrieved from https://www.bu.edu/.../Berk_Measuring-the-effectiveness-of-fac-mentoring-relationship.
- Black, A. C., & McCoach, D. B. (2008). Validity study of the thinking styles inventory. *Journal for the Education of the Gifted*, 32(2), 180-210. Retrieved from <https://files.eric.ed.gov/fulltext/EJ826290.pdf>

- Boeren, E., Lokhtina-Anthniou, I., Sakurai, Y., & Herman, C. (2015). Mentoring: A review of early career researcher studies. *Frontline, Learning Research*, 3(3), 64-76. Retrieved from <https://files.eric.ed.gov/fulltext/EJ1091054.pdf>
- Chesnut, S. R., Siwatu, K. O., Young, H. A., & Tong, Y. (2015). Examining the relationship between the re-search training environment, course experiences, and graduate students' research self-efficacy beliefs. *International Journal of Doctoral Studies*, 10, 399-418. Retrieved from ijds.org/Volume10/IJDSv10p399-418Chesnut0914.pdf
- Chumbley, S. B., Haynes, J. C., & Stofer, K. A. (2015). A measure of students' motivation to learn science through agricultural STEM emphasis. *Journal of Agricultural Education*, 56(4), 107-122. doi: 10.5032/jae.2015.04107
- Feng, R. Xie, Y., & Wu, J. (2024). How is personality related to research performance? The mediating effect of research engagement. *Front. Psychol.* 14:1257166. doi: 10.3389/fpsyg.2023.125716.
- Huanga, S., & Yang, C. (2024). Doctoral students' research motivation and outcomes in China: Training environment moderation. *Cogent Education* 11(1), 2378261. <https://doi.org/10.1080/2331186X.2024.2378261>
- Gilmore, J., & Feldon, D. (2010, April 30-May 4). *Measuring graduate students' teaching and research skills through self-report: Descriptive findings and validity evidence*. A paper presented at the annual meeting of the American Educational Research Association, Denver, CO. Retrieved from <https://files.eric.ed.gov/fulltext/ED509407.pdf>
- Johnston, L., Sampson, K. A., Comer, K., & Brogt, E. (2016). Using doctoral experience survey data to support developments in postgraduate supervision and support. *International Journal of Doctoral Studies*, 11, 185-203. Retrieved from ijds.org/Volume11/IJDSv11p185-203Johnston2272.pdf
- Kerrigan, M. R., & Hayes, K. M. (2016). EdD students' self-efficacy and interest in conducting research. *International Journal of Doctoral Studies*, 11, 147-162. Retrieved from <http://ijds.org/Volume11/IJDSv11p147-162Kerrigan1975.pdf>
- Kimanje, E., & Lunyolo, O. (2022). Intricacies of supervisory research during Covid-19 era among doctoral students and supervisors in a premier University in Uganda. *The Uganda Higher Education Review Journal*, 10(1), 164-196. <https://doi.org/10.58653/nche.v10i1.11>
- Kumar, V. K., & Holman, E. R. (1997). The creativity styles questionnaire-revised. *Creativity Research Journal*, 10(1), 51-58. doi: 10.1207/s15326934crj1001_6
- Leech, N. L. (2012). Educating knowledgeable and skilled researchers in doctoral programs in schools of education: A new model. *International Journal of Doctoral Studies*, 7, 19-37. doi: 10.28945/1558
- Leech, N. L., Crepeau-Hobson, F., Perkins, M., & Haug, C. A. (2015). Research and evaluation methods programs in the United States. *Quality Approaches in Higher Education*, 6(2), 1-12. Retrieved from asq.org/edu/2015/.../research-and-evaluation-methods-programs-in-the-united-states
- Leech, N. L., & Haug, C. A. (2015). Investigating graduate level research and statistics courses in schools of education. *International Journal of Doctoral Studies*, 10, 93-110. Retrieved from ijds.org/Volume10/IJDSv10p093-110Leech0658.pdf
- Lovitts, B. E. (2005). Being a good course-taker is not enough: A theoretical perspective on the transition to independent research. *Studies in*

- Higher Education*, 30(2), 137-154. doi:10.1080/03075070500043093
- Lovitts, B. E. (2008). The transition to independent research: Who makes it, who doesn't, and why? *The Journal of Higher Education*, 79(3), 296-325. Retrieved from www.bhertzt.nl/wp-content/.../07/The-transition-to-independent-research.lovitts.pdf
- Lunyolo, O., Bakkabulindi, F., & Tusiime, H. M. (2019). Testing Leech's model on successful doctoral student completion in Makerere University. *Journal of Sociology and Education in Africa*, 16(2), 1-21.
- Montuori, A. (2008). The joy of inquiry *Journal of Transformation Education*, 6(1), 8-26. Retrieved from <https://doi.org/10.1177/1541344608317041>
- Montuori, A., & Donnely, G. (2013). Creative inquiry and scholarship: Applications and implications in doctoral degree. *World Futures: The Journal of Global Education*, 69(1), 1-19. Retrieved from <http://dx.doi.org/10.1080/02604027.2013.748575>
- Nakanjako, D., Katamba, A., Kaye, D. K., Okello, E., Kanya, M. R., Sewankambo, N., & Kiiza, H. M. (2014). Doctoral training in Uganda: Evaluation of mentoring best practices at Makerere University College of Health Sciences. *BMC Medical Education*, 14(9), 1-8. Retrieved from <https://bmcmmededuc.biomedcentral.com/articles/10.1186/1472-6920-14-9>
- Phillips, E. M., & Pugh, D. S. (2010). *How to get a PhD: A handbook for students and their supervisors* (5thed.). London, UK: Open University Press.
- Schniederjans, M. J., & Kim, E. B. (2005). Relationship of student undergraduate achievement and personality characteristics in a total web-based environment: An empirical study. *Decision Sciences Journal of Innovative Education*, 3(2), 205-221. Retrieved from 352 Retrieved from <https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1540-4609.2005.00067.x>
- Sverdlick, A., Hall, N. C., Mc Alpine, L., & Huddard, K. (2018). The PhD experiences: A review of the factors influencing doctoral students' completions, achievement, and well-being. *International Journal of Doctoral Studies*, 13, 361-388. Retrieved from <http://doi.org/10.28945/4113>
- Wamala, R., & Ssembatya, V. A. (2013). Scholarly productivity in developing countries: An analysis of levels and patterns among doctoral holders in Uganda. *Contemporary Issues in Education Research*, 6(2), 163-172. Retrieved from <https://files.eric.ed.gov/fulltext/EJ1073193.pdf>
- Wang, X., & Cheng, Z. (2020). Cross-sectional studies: strengths, weaknesses, and recommendations. *Chest*, 158(1), S65-S71. <https://doi.org/10.1016/j.chest.2020.03.012>
- Woolderink, M., Putnik, K., van der Boom, H., & Klabbbers, G. (2015). The voice of PhD candidates and PhD supervisors. A qualitative exploratory study amongst PhD candidates and supervisors to evaluate the relational aspects of PhD supervision in the Netherlands. *International Journal of Doctoral Studies*, 10, 217- 235. Retrieved from ijds.org/Volume10/IJDSv10p217-235Woolderink0852.pdf
- Yazdani, S., & Shokooh, F. (2018). Defining doctorateness: A concept analysis. *International Journal of Doctoral Studies*, 13, 31- 48. Retrieved from <http://doi.org/10.28945/3939>