Predicting Graduate Students' Self-Efficacy for Thesis/Dissertation Completion in Sub-Saharan Africa

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Abstract

Despite the global surge in enrollment for master's and Ph.D. programs worldwide and, to some extent, in Sub-Saharan Africa, a considerable lag in completing theses and dissertations (TD) persists. Personal, situational, and contextual factors, such as supervision arrangements and research abilities, have been correlated with the time taken for TD completion. However, beyond these variables, there remains a significant gap in our understanding of what precisely predicts TD completion. To contribute to this knowledge deficit, we conducted a study to determine the predictive nature of specific information sources on students' self-efficacy regarding TD completion. These sources encompass gender, graduate program level, coursework completion, prior statistical skills, and research knowledge. A survey built in Qualtrics was distributed to 65 masters and doctoral students in the Agricultural Education and Extension departments at four universities in Sub-Saharan Africa. The findings indicated that most respondents possessed prior experience with statistics or research and had completed their coursework. Nevertheless, self-reported research knowledge and self-efficacy for TD completion were rated average, signaling a clear need for proficient research skills to ensure punctual TD completion. Furthermore, hierarchical regression revealed that additional predictors, beyond research knowledge alone, led to a 42% increase in TD self-efficacy for completion. These findings suggest that graduate programs should prioritize providing students with more research-related mastery experiences. This could be accomplished by offering a broader range of statistical courses, hands-on research opportunities, and avenues for professional development. Additionally, institutions should evaluate to address the specific TD research requirements of graduate students through a gendered lens.

Keywords: dissertation-thesis completion, self-efficacy sources, agricultural education, graduate students, Africa, personal and contextual factors

Introduction and Literature Review

Until recently, Sub-Saharan Africa (SSA) had been grappling with constraints on educational resources, low student admissions, and delays in graduation. On the other hand, MacGregor's (2020) report revealed a global surge in higher education gross enrollment, rising from 10% in 1970 to 35% in 2014. Notably, this growth was particularly pronounced in the new millennium, witnessing global enrollment jump from 19% in 2000 to 38% in 2018 (MacGregor, 2020). In 2018, North America, the pioneer in promoting expanded access to higher education, achieved the highest tertiary enrollment rate of 86%, followed by Europe, Central Asia, Central Europe, and the Baltics at 70% and 62% respectively (MacGregor, 2020). However, this progress has not been uniform. Latin America and the Caribbean attained a cumulative enrollment rate of 52%, East Asia and the Pacific at 46%, the Middle East and North Africa at 42%, and South Asia at 24%. In contrast, SSA lagged significantly behind, recording a meager enrollment rate of 9% (MacGregor, 2020).

Graduate education in SSA has encountered various challenges over the years. Financial constraints emerged as the primary reason behind low graduate student enrollment and incomplete PhDs, as pinpointed by the British Council of German Academic and Exchange Service (BCR, 2018). The BCR report underscored the financial difficulties faced by institutions and students in SSA. The shortage of qualified Ph.D. holders further inhibited academic progress by diluting training quality and hampering graduate student enrollment (Hayward & Ncayiyana, 2014; MacGregor, 2020; The Kigali Communique, 2014). It is crucial to note that incomplete graduate studies are not unique to SSA, as even countries with ample graduate-level funding and training opportunities wrestle with it. For example, Jiranek's (2010) findings revealed a 33% attrition rate among Australian graduate students over ten years (1996-2006). In the United States, Holmes et al. (2010, p.1) noted a significant proportion of Ph.D. candidates abandoning their programs with *All but Dissertation (ABD)* status to pursue employment.

Research indicates that more faculty members holding PhDs can improve graduate training and enhance student enrollment and the number of graduates venturing into research and development careers (Elgar & Klein, 2004; Molla & Cuthbert, 2016). MacGregor (2020) also established a correlation between the surge in global college enrollment and enhanced research capabilities, underscoring the importance of having more Ph.D. holders to facilitate research continuity and mentor graduate students' research skills to engage in their research endeavors effectively. Scholars also emphasize the criticality of graduate students' capacity to conduct original empirical research, a hallmark of conferring a thesis or Ph.D. degree (Gibbs et al., 2012).

To effectively tackle emerging and intricate challenges within the agricultural system, graduate programs in agricultural education and leadership must acknowledge the distinctive role played by social science research. The National Academy of Sciences (NAS) 2009 underscored this aspect, urging agricultural colleges to reevaluate their position in higher education and direct their attention towards issues impacting global food and agriculture systems. The NAS further emphasized the importance of instilling essential skill sets in agricultural students to foster a sustainable future. Graduates specializing in agricultural education and communication can significantly contribute to the sustainable utilization of environmental resources if they possess adequate research skills (Elgar & Klein, 2004). Additionally, research skills are imperative for master's degree holders seeking to confidently advance to Ph.D. levels or assume roles in agricultural education, communication, or leadership that mandate exemplary research skills.

An Overview of Self-Efficacy and Information Sources

According to Bandura (1997), self-efficacy, a subset of social cognitive theory, refers to "the conviction that one can successfully execute an action necessary to achieve a goal" (p. 79). In this study, self-efficacy for thesis or dissertation (TD) completion implies graduate students' perceived ability to complete their TD research within the stipulated time successfully. Measurements of self-efficacy involve capability judgments of self-assessed confidence and should be measured at appropriate levels of specificity using multiple statements or questions containing verbs such as *can* or *be* (Bong, 2006). The statements should also solicit mastery expectations based on personal competence or knowledge level of the task to be performed (Bandura, 1997, 2006; Bong, 2006).

Self-efficacy scholars claim it significantly enhances human motivational constructs such as self-concept, confidence, and goal achievement (Bandura, 1977; Pajares Urdan, 2006). Findings of most prior researchers revealed a correlation between graduate-level research ability and research and technical writing skills, corroborating self-efficacy's role (Eze et al., 2020; Lessing & Lessing, 2004; Marshall et al., 2017; Motseke, 2016). Since high self-efficacy equates to high effectiveness and persistence in the face of challenging tasks (Pajares Urdan, 2006), its elevated levels among graduate students in SSA should help them persist amidst personal and contextual setbacks associated with TD research tasks (see Bandura, 1986, 1997, 2010; Hayward & Ncayiyana, 2014). Furthermore, high levels of self-efficacy can motivate students to invest more effort while closely monitoring their TD progress and graduation timeline.

According to Bandura (1997), self-efficacy development is a multifaceted process influenced by various factors. Bandura (1997) stated that self-efficacy is principally developed through inferences drawn from four information sources: enactive mastery experience, vicarious experience, verbal/social persuasion, and physiological arousal. Most self-efficacy scholars concur that mastery experience is the most impactful, followed by vicarious and verbal persuasions, while physiological arousals harm self-efficacy development (Bandura, 1997; Tschannen-Moran et al., 1998; Usher & Pajares, 2008). However, the impact of these primary sources is further dependent on the prevailing personal, contextual, and situational factors (Bandura, 1997).

Information Sources and TD Completion Self-Efficacy

Previous studies have underscored the significance of Bandura's (1997) mastery experiences, vicarious experiences, social persuasion, and physiological arousal in shaping graduate students' self-efficacy for TD completion (Azkah et al., 2016; Bolli et al., 2015; Lee et al., 2020; Lessing & Lessing, 2004; Heide et al., 2019; Main, 2014; Marshall et al., 2017; Motseke, 2016).

Studies on mastery sources suggest that graduate students' self-efficacy for TD completion can be enhanced through independent research knowledge and practical experience in research (Lessing & Lessing, 2004; Motseke, 2016). Additionally, hands-on experience in a publishing internship program has boosted doctoral students' research confidence and publishing ability (Lee et al., 2020). Research on social persuasion indicates that positive feedback from supervisors and frequent advisor-advisee communications can elevate students' confidence levels and contribute to them successfully completing TD research (Azkah et al., 2016; Heide et al., 2019; Main, 2014). Moreover, consistent communication between advisors and advisees aid

in keeping research projects on track (Main, 2014). Furthermore, on-campus graduate conferences, providing opportunities for vicarious experiences, correlate with higher graduation rates among doctoral students (Bolli et al., 2015). However, physiological arousal, such as imposter syndrome and writing anxiety, can impede students' ability to work on and complete their dissertations (Marshall et al., 2017).

Personal, situational, and contextual factors have also been linked to students' dissertation completion confidence in previous research (Devonport & Lane, 2006; Ellis, 2001; Eze et al., 2020; Main, 2018; Park, 2005). Gender dynamics, age, and nationality have been shown to play a role in dissertation completion rates. Situational factors, including research topic selection, program administration assistance, financial resources, discipline, and alums status, can influence graduate students' perceived TD completion confidence (Heide et al., 2019; Eze et al., 2020; Park, 2005).

Regarding gender dynamics, it has often been assumed that female students are disadvantaged regarding graduation rates attributable to research challenges (Luan & Fenske, 1996). Interestingly, Main's (2018) study showed that female doctoral students completed their graduate degrees faster when mentored by same-gender faculty and in departments with more female faculty. Moreover, female students working with female advisors graduated faster than male students with male advisors (Main, 2018). In contrast, Devonport and Lane (2006) found that male students were likelier to perceive the dissertation stage as less complicated and would easily engage in active coping strategies than their female counterparts. According to Devonport and Lane (2006), females tended to engage in self-blame, emotional venting, and behavioral disengagement when dealing with dissertation-related stress. Age differences also impact graduate studies completion rates, with younger students completing their studies faster than older ones (Park, 2005). Potential reasons for lower graduation rates among adult learners have been a lack of computer skills, research abilities, stress, supervisory issues, and employer workload (Motseke, 2016).

Nationality influences graduate students' degree completion rates (Ellis, 2001; Park, 2005). International students, in particular, are susceptible to various challenges that can hinder their degree completion. For instance, language barriers may impede international students' effective communication with faculty, high-quality paper and dissertation writing, and full participation in class discussions (Ellis, 2001). Similarly, cultural differences can lead to feelings of isolation and disconnection from the academic community, resulting in stress and homesickness (Park, 2005). Limited access to financial resources, scholarships, and funding opportunities can also make it difficult for international students to afford tuition, books, and living expenses (Ellis, 2001).

Situational factors affecting graduate students' perceived TD completion confidence include the ease of research topic selection, program administration assistance, retention of the original topic, and financial resources (Heide et al., 2019). Other relevant factors encompass research orientation, study habits, perceived time to degree completion, mode of attendance, discipline, and alum status (Eze et al., 2020; Park, 2005). Completion rates are higher among full-time students, science majors, and alums (Eze et al., 2020; Park, 2005). Limited experience and knowledge in research mastery, particularly among social science students, have been identified as significant obstacles to graduate students' adequate TD progress and completion (Kearns et al., 2008; Meerah et al., 2012; Motseke, 2016). Nevertheless, most science programs often recommend more practical graduate-level statistical courses, which enhance students' rigor in TD (general observation).

It is worth noting that most research studies bolster Bandura's (1997) theoretical assumptions regarding self-efficacy and its information sources, underscoring the significance of mastery experiences, vicarious experiences, and social persuasion in shaping graduate students' self-efficacy for TD completion. Correspondingly, graduate supervisors, particularly in AGEDEX programs, should be pivotal in boosting students' self-efficacy to increase their likelihood of completing TD research projects. They can do this by guiding students in selecting practical research courses, facilitating an early choice of research topics, and exposing them to pertinent TD efficacy information sources. Many research studies previously discussed in the text underscore the importance of AGEDEX program advisors in facilitating students' involvement in research-related activities, thereby enhancing their research capabilities and confidence for TD engagement. Furthermore, departments hosting AGEDEX programs should promote favorable contextual and situational elements that impact these self-efficacy sources.

Conceptual Framework

Bandura's (1997) social cognitive theory proposes that human behavior results from a dynamic interaction between personal, environmental, and behavioral factors. Using social cognitive theory as the foundation for this study, the development of self-efficacy is a multifaceted process influenced by various factors (Bandura, 1997). Self-efficacy is primarily cultivated through inferences drawn from four information sources: mastery and vicarious experiences, feedback, and physiological arousal. However, the impact of these information sources is also contingent on the prevailing personal, contextual, and situational factors (Bandura, 1997).

Mastery experience involves performing a specific task and instilling the belief that similar tasks can be successfully accomplished in the future (Bandura, 1997). Mastery experience encompasses previous performance encounters and is thus the most convincing evidence of successful task execution (Bandura, 1997; Tschannen-Moran et al., 1998; Usher & Pajares, 2008). Vicarious experiences occur when individuals observe others performing a given task, providing insight into the task's nature (Bandura, 1997, p. 101). Additionally, verbal or social persuasion includes oral or written messages, such as motivational speeches, comments, and feedback, regarding an individual's task performance (Bandura, 1997, 1986). Constructive and positive feedback can boost performance confidence, while negative feedback can diminish the perceived ability to succeed in future endeavors. On the contrary, physiological arousals involving negative emotions like stress, trembling, and anxiety can counteract performance beliefs (Bandura, 1997). Most self-efficacy scholars agree mastery experience is the most influential source, followed by vicarious and verbal persuasions (Bandura, 1997; Tschannen-Moran et al., 1998; Usher & Pajares, 2008).

The social cognitive theory was employed to ascertain whether graduate students' research knowledge, gender, coursework completion, and prior statistical skills could predict their self-efficacy for thesis and dissertation completion (Bandura, 1986, 1997). In this regard, research knowledge and prior research or statistical experience defined mastery experiences for the thesis and dissertation (TD). In contrast, gender and course completion defined additional relevant personal and contextual factors that might explain their varying effects on TD completion self-efficacy. Research evidence points to practical (mastery) research experience as the most potent source of mastery, significantly enhancing graduate-level research skills and

self-efficacy for TD completion (Lee et al., 2020; Lessing & Lessing, 2004). Self-efficacy scholars believe that personal mastery expectations drive behavioral change, and past experiences and attributions of success to skill or chance may influence self-efficacy expectations (Bandura, 1997; Sherer et al., 1982). It is also crucial to consider other personal, contextual, and situational variables that could impact self-efficacy expectations (Schunk & Usher, 2012; Usher & Pajares, 2008).

Therefore, evaluating self-efficacy beliefs can help prevent failure or additional delays in TD completion, especially among SSA AGEDEX students, as most studies suggest a positive correlation between students' self-perceived abilities and the actual completion of research-related tasks, including the TD phase (see Lane, 2003; Varney, 2010). Furthermore, given the low graduation rates in SSA, this study provides insights for prioritizing the development of research capabilities of AGEDEX students globally. Meanwhile, maintaining a robust pool of AGEDEX faculty and addressing complex agricultural challenges call for consistently graduating high-quality master's and doctoral graduates (NAS, 2009). The NAS emphasized the need for agricultural programs to equip students with the essential skill sets required to adapt to ongoing changes and lay the groundwork for a sustainable future.

Purpose and Objectives

The study aimed to identify the personal and contextual factors predicting TD completion self-efficacy among AGEDEX graduate students in Sub-Saharan Africa. Gender, graduate program level, coursework completion, prior statistical skills, and research knowledge were the defining personal and contextual factors used to predict AGEDEX graduate students' TD completion self-efficacy in SSA – a region with the lowest master's and Ph.D. graduation rates. The study aimed to achieve three research objectives:

RO1: Describe the demographic characteristics, TD completion self-efficacy, and the level of research knowledge of agricultural education and extension graduate students from selected universities in Sub-Saharan Africa.

RO2: Determine whether gender, graduate program level, coursework completion, and prior statistical skills predict TD completion self-efficacy over and above the research knowledge level.

Methods

Research Design, Population, and Sampling Procedure

To investigate the research objectives, a non-experimental cross-sectional survey design (Johnson, 2001) was employed, involving a convenience sample of 65 AGEDEX graduate students (both master's and Ph.D.) from four universities in Kenya, Uganda, Tanzania, and Ethiopia within SSA. The universities were selected based on accessibility. It is worth noting that this study is part of a broader collection of publications derived from the same dataset (Kirkman & Chen, 2011).

After receiving approval from the Institutional Review Board (IRB) of Texas Tech University, a quantitative online survey was created and distributed to respondents within the

chosen universities using Qualtrics. The distribution process included sending reminders weekly and adhering to the online survey administration criteria proposed by Dillman et al. (2014). Remarkably, all 65 students invited to participate responded, leading to a remarkable 100% response rate. This rate was considered acceptable according to established response rate standards in the social science literature (Baruch & Holtom, 2008). However, it is important to acknowledge that the scope of the findings is confined to the participating universities and cannot be extrapolated to encompass all graduate students across SSA.

Variable Description and Measurement

Building on the premise that an individual's confidence in their capability to accomplish a task is shaped by their expertise and familiarity with the task domain (Bandura, 1997; Tschannen-Moran et al., 1998), the self-efficacy of AGEDEX students for completing their theses or dissertations (TDs) in this study was defined by their perceived confidence in successfully finishing their TDs within the specified timeframe and their perceived proficiency in scientific writing. Two questions were posed to measure this construct: 'To what extent are you confident in your ability to complete your thesis or dissertation within the prescribed time?' and 'How confident are you in your competence in scientific and technical writing?'. Both confidence questions were measured on a scale of 1 (not confident) to 5 (very confident). The ratings for these two statements were averaged to formulate a TD completion self-efficacy index, ranging from 1 (low TD completion self-efficacy) to 5 (high TD completion self-efficacy). Past research has validated that an index derived from just two statements can yield valuable insights across diverse contexts (e.g., Edbrooke-Childs et al., 2016; Topp et al., 2015).

The four predictor variables (PVs) were measured with the following questions: 'How proficient are you in this topic (research knowledge level)?' 'What is your gender?' 'Specify your program of study (graduate program level).' and 'Did you have any previous research/statistical experience before joining your graduate program?' The research knowledge level was ascertained through 38 statements covering various research methods and statistics domains, with each statement rated on a scale of 1 (Very much below average knowledge) to 5 (Extensive knowledge). The cumulative scores of the 38 statements were aggregated to establish a mean research knowledge level/index score. A reliability coefficient of Cronbach's $\alpha = .94$ affirmed the robustness of the index, surpassing the recommended 0.70 threshold (Nunnally, 1978). Personal and contextual factors were nominal-level variables and encompassed gender (0 = male, 1 = female), graduate program level (0 = Master's, 1 = PhD), previous research/statistical experience (0 = no, 1 = yes), and completion of coursework (0 = no, 1 = yes).

Data Collection Procedure

The proposed instrument underwent a thorough evaluation by a panel of experts from the Department of Agricultural Communication and Education at Texas Tech University. Subsequently, the instrument was pilot-tested with a convenience sample of 30 participants from the United States and Kenya. Respondents were provided with the online questionnaire through a Qualtrics link and were allowed to offer feedback to enhance or clarify the instrument. The cognitive interviews produced limited feedback, so the knowledge and two confidence items were retained in their original format for the subsequent data collection phase. Potential respondents were given a cover letter containing a link to the online questionnaire distributed through their respective program leaders in the AGEDEX departments. The research knowledge

items displayed a Cronbach's alpha coefficient surpassing .97, while the TD self-efficacy construct exhibited a coefficient of .84 (post hoc), indicating satisfactory inter-item consistency (Nunnally, 1978).

Data Analysis

Hierarchical regression was utilized R^2 to determine if there was a difference in the variance explained in TD completion self-efficacy by gender, prior statistics, coursework completion, and graduate program level above and beyond the research knowledge level. By holding known predictors constant in the model, hierarchical regression determines the unique predictive influence of a new variable on the outcome (Field, 2018). The test allowed the researcher to choose the order of entering the variables into the model based on previous research (Mertler & Reinhart, 2017). As a result, known predictors were entered into the first model, and new predictors were included in the second model.

The hierarchical model applied in this study was depicted by the general regression formula:

$$Y = B_0 + B_1X_1 + B_2X_2 + \cdots + B_nX_n + \varepsilon_i, \quad (1)$$

where Y was the outcome variable, Xs, the predictor variables, Bs, the unstandardized beta coefficients, and ε_i , the error term. Thus, B_0, the intercept, was the value of the Y variable when all Xs = 0; B_1 was the regression coefficient for variable 1; B_2 was the regression coefficient for variable 2; B_n was the regression coefficient for n^{th} variable.

Model 1 for predicting TD completion self-efficacy utilized the equation:

$$(Y) = B_0 + B_1 Research\ knowledge\ level + \varepsilon_i \quad (2)$$

Model 2 for predicting TD completion self-efficacy utilized the equation:

$$(Y) = B_0 + B_1 Research\ knowledge + B_2 Gender + B_3 Prior\ statistics + B_4 Graduate\ progral\ level + B_5 Coursework\ completion + error \quad (3)$$

Summary statistics were conducted for ratio-level variables, and frequencies and percentages for nominal characteristics were cross-tabulated by graduate program level (master's and PhD). The study utilized hierarchical multiple regression to determine if the addition of gender, graduate program level, prior statistical experience, and coursework completion improved the prediction of self-efficacy to complete TD over and above the weighted research knowledge alone at the .05 alpha level set a priori.

All assumptions were checked to validate the use of the regression analysis (Field, 2018; Tabachnick & Fidell, 2019). Partial regression plots and a plot of studentized residuals against predicted values confirmed linearity. Durbin-Watson value of 1.168 implied residual independence. A solid line on the Q-Q scatterplot suggested normality. Homoscedasticity was assumed with randomly distributed observations, indicating no curvature as depicted on a residual scatterplot. Tolerance values were above 0.2, and VIFs were below 10 for all predictors in the second regression model, implying the absence of multicollinearity (Menard, 2010). There were no influential observations, as all studentized residuals fell below 3.22 on the studentized residuals.

Upon meeting all the assumptions, research knowledge level was entered as the only predictor variable in the first model (Step 1), using Equation 2. Gender, graduate program level,

coursework completion, and prior statistics/research experience were added as predictors in the second model (Step 2), using Equation 3. The regression coefficients were further assessed to determine those characteristics that statistically and significantly predicted self-efficacy for TD completion, using *p* values at a .05 alpha level set a priori.

Results

Describe Respondents from Selected Sub-Saharan Africa Universities

Males (61%) outnumbered females (39%) in the master's program, while the PhD group had more females (70%) than males (30%). Within the master's group, the majority (56%) reported prior experience with statistics/research. On the contrary, most PhD students (60%) reported not having previous statistics or research experience before commencing graduate school. The majority of master's students (56%) and PhD students (83%) had completed coursework. Table 1 summarizes the frequencies and percentages.

Table 1
Demographic Characteristics (N = 65)

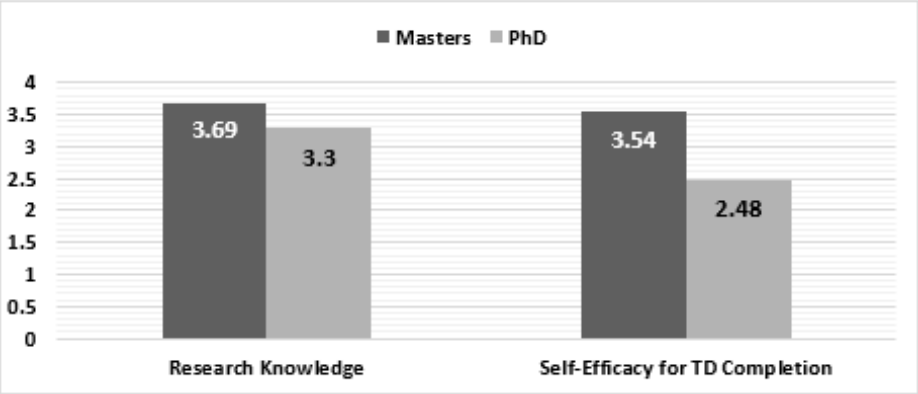
Variable	Master's		PhD	
Gender	*n*	*%*	*n*	*%*
Male	22	61	8	30
Female	14	39	21	70
Total	36	100	30	100
Prior statistical experience				
No	16	44	17	60
Yes	20	56	12	40
Total	36	100	29	100
Coursework completion				
Yes	20	56	24	83
No	16	44	5	17
Total	36	100	29	100

The average self-efficacy score for TD completion among master's students (M = 3.54, SD = 1.07) was higher than that for PhD students (M = 2.48, SD = 1.31). Similarly, the master's students perceived their average research knowledge higher (M = 3.69, SD = 0.57) than that of the PhD students (M = 3.30, SD = 0.50). Table 2 and Figure 1 show self-efficacy and knowledge levels of graduate students.

Table 2
AGEDEX Students' TD Completion Self-efficacy and Research Knowledge (N = 65)

Variable	*M*	*SD*	*n*	SE_M	Min	Max
Self-efficacy for TD Completion						
Master's	3.54	1.07	36	0.18	1.00	5.00
PhD	2.48	1.31	29	0.24	1.00	5.00
Research knowledge Level						
Master's	3.69	0.57	36	0.09	2.58	4.89
PhD	3.30	0.50	30	0.09	2.23	4.50

Figure 1
Means Scores of Graduate Students' Research Knowledge and Self-efficacy Levels (n = 65)



Factors Predicting TD Completion Self-efficacy

The *F*-test for Model 1 with research knowledge as the only predictor entered was statistically significant, $F(1, 63) = 13.66$, $p < .001$, $R^2 = 0.18$ (see Table 4). Research knowledge explained 18% of the variation in TD completion self-efficacy. The findings indicated a one-point increase in research knowledge raised TD completion self-efficacy by .97 units on average (see Table 5).

Table 4
Models for Predicting Students' Self-efficacy for TD completion (N= 65)

Model	R^2	df_{mod}	df_{res}	*F*	*p*	ΔR^2
1	0.18	1	63	13.66	< .001	0.18
2	0.60	4	59	15.16	< .001	0.42

Note. ** $p < .001$, Model 1 - Adjusted R^2 =.17, Model 2 - Adjusted R^2 = .56

Additional variables were entered into the model to determine if variables beyond research knowledge predicted TD completion self-efficacy. The *F*-test for Model 2 was statistically significant, $F(4, 59) = 15.16$, $p < .001$, $\Delta R^2 = 0.42$. The findings indicated that

adding gender, graduate program level, coursework level, and prior statistics, improved model prediction by an additional 42% of the variation in students' TD completion self-efficacy. Model 2 was more appropriate model for predicting TD completion self-efficacy (see Table 4).

AGEDEX students' self-efficacy for timely TD completion was still statistically significantly predicted by the students' level of research knowledge, $B = 0.67$, $t(59) = 3.24$, $p = .002$ (see Table 5). In this case, the findings indicated a one-unit increase in research knowledge increased students' self-efficacy in completing TD by 0.67 units on average, which was a lower contribution than when it was the only predictor entered in the model (Model 1).

Being female also statistically significantly predicted TD completion confidence, $B = -0.70$, $t(59) = -2.89$, $p = .005$. In this case, being female reduced students' mean self-efficacy for TD completion by 0.70 units. Prior experience with statistics and research statistically significantly predicted students' self-efficacy for TD completion; $B = 0.93$, $t(59) = 4.21$, $p < .001$. Prior statistical/research experience increased the mean value of students' self-efficacy in completing TD by 0.93 units. The level of the graduate program had no effect on students' self-efficacy for completing their TD; $B = -0.12$, $t(59) = -0.47$, $p = .642$, implying that the average self-efficacy for completing a TD did not differ between master's and doctoral students. Coursework completion status was statistically significantly related to students' self-efficacy for completing the TD on time, $B = 1.10$, $t(59) = 4.34$, $p < .001$.The results indicated students' self-efficacy for completing TD on time increased by 1.10 units after coursework completion. The results of each regression models are presented in Table 5.

Table 5
Predicting TD Completion Self-efficacy (N = 65)

Variable	*B*	*SE*	95% CI	β	*t*	*p*
Model 1						
Constant	-0.37	0.94	[-2.25, 1.51]	0.00	-0.39	.698
Research knowledge [a]	0.97	0.26	[0.45, 1.50]	0.42	3.70	< .001
Model 2						
Constant	0.34	0.81	[-1.28, 1.95]	0.00	0.42	.676
Research knowledge [a]	0.67	0.21	[0.26, 1.08]	0.29	3.24	.002
Gender[b]	-0.70	0.24	[-1.18, -0.21]	-0.27	-2.89	.005
Prior statistical experience[c]	0.93	0.22	[0.49, 1.37]	0.36	4.21	< .001
Graduate program level[d]	-0.12	0.25	[-0.62, 0.39]	-0.05	-0.47	.642
Coursework completion[c]	1.10	0.25	[0.60, 1.61]	0.40	4.34	< .001

Note. Model 1 - Adjusted R^2 =.17; Model 2 - Adjusted R^2 = .56; [a]Scale is 1 = Little research knowledge to 5 = Extensive research knowledge; [b]Scale is 0 = Male, 1 = Female; [c]Scale is 0 = No, Yes = 1; [d]Scale is 0 = Master's, 1 = PhD.

Discussion

A significant proportion of male and female graduate students in the current study possessed prior experience in statistics or research and had completed their coursework. Despite this, students perceived themselves as having average research knowledge and low confidence in completing their TDs on time (TD completion self-efficacy). Master's students reported an average level of self-efficacy for TD completion, whereas PhD students reported a slightly lower level than the master's group. Furthermore, the results of hierarchical regression indicated that gender, graduate program level, coursework completion, and prior experience with statistics contributed to an additional 42% variance in predicting students' TD completion self-efficacy beyond the influence of research knowledge alone. However, among these factors, research knowledge, prior statistical experience, and coursework completion were the only statistically significant positive predictors, with gender showing a negative impact.

The findings of this study revealed low levels of research skills, aligning with previous research conducted outside of Africa that also identified a need for more research skills among graduate students (Kluever, 1997; Meerah et al., 2012). Surprisingly, Ph.D. students exhibited significantly lower levels of self-efficacy for TD completion compared to master's students, in contrast to findings by researchers like Bussell et al. (2017), who reported statistically significantly higher levels of research confidence among Ph.D. students. Additionally, O'Clair et al. (2013) found higher self-perceived confidence among graduate students after completing coursework. The demanding nature of PhD research might account for the low self-efficacy observed among the sampled PhD students.

Following social-cognitive theory, the low self-efficacy reported within this sample implies that students have a diminished self-perceived ability to engage proficiently in TD research (Bandura, 1997). Enhancing self-efficacy is critical, as it directly impacts students' willingness to invest the necessary effort to achieve their TD research goals (Bandura, 1997; Tschannen-Moran et al., 1998). The combined low scores on research skills and students' research confidence in this study underscore the importance of strengthening graduate students' research skills.

The study's findings revealed a positive correlation between students' TD completion self-efficacy, coursework completion, research knowledge level, and prior experience with statistics – all of which constitute mastery experience opportunities, known as the most impactful self-efficacy information source (Bandura, 1997). Engaging in statistical courses and hands-on experiences related to statistical activities offers performance opportunities that cultivate graduate students' research knowledge and the belief that TD-phase research is attainable (Bandura, 1986, 1997). It was anticipated that respondents in this study would exhibit higher research knowledge and TD self-efficacy, particularly after successfully completing all required courses, including statistics, and gaining additional hands-on research or statistical experience (Bandura, 1997; Humphrey et al., 2012; Singh, 2014).

While the results of the hierarchical regression displayed a positive connection between TD self-efficacy and its sources, the descriptive scores indicated low levels of research knowledge and self-efficacy among the respondents. These findings underscored the necessity to enhance the provision of mastery-building opportunities. Some mastery experiences include offering more statistical courses and hands-on engagement with research activities such as statistical software usage, publishing resources, and other relevant strategies identified in the literature. These efforts aim to bolster the research expertise and confidence required during the

TD phases (Almoustapha & Uddin, 2017; Ho et al., 2010; Kluever, 1997; Lee et al., 2020; Lessing & Lessing, 2004; Ngozi & Kayode, 2014).

Moreover, being female or a Ph.D. student correlated with reduced TD completion self-efficacy. Many scholars have previously reported similar gender effects among graduate students, indicating the persistence of these long-standing trends (Ellis, 2001; Jiranek, 2010; Lebcir et al., 2008; Rodwell & Neumann, 2008; Seagram et al., 1998; Wright & Cochrane, 2000). Male graduate students often exhibit lower inclinations for Ph.D. non-completion and skepticism towards TD research (Devonport & Lane, 2006; Ellis, 2001). Nevertheless, the statistically significant impact of gender and graduate program completion validates that various personal, contextual, and situational factors influence the positive role of self-efficacy information sources (see Bandura, 1986, 1997; Tschannen-Moran et al., 1998). Thus, these sources should be continually evaluated to ensure they effectively cater to the needs of graduate students.

Conclusion and Implications

The study underscores the need to bolster research skills among graduate students in sub-Saharan Africa (SSA), given that the findings revealed notably low levels of research knowledge and self-efficacy within the sampled student population. This suggests a need for enhanced students' overall confidence in effectively participating in TD research endeavors. The intricate demands of PhD research could account for the observed low self-efficacy among the sampled PhD students. Therefore, providing robust support for Ph.D. students in SSA becomes essential, aiming to elevate their self-efficacy and equip them with the essential competencies needed for the timely completion of their research.

The results propose the need for opportunities that facilitate mastery-building, encompassing increased exposure to statistical courses, hands-on engagement with research activities, and access to pertinent resources. These measures are crucial to enhancing research expertise and instilling the confidence requisite for the TD phase in SSA. Notably, it is vital to acknowledge that being a female student or pursuing a Ph.D. instead of a Master's degree was associated with diminished self-efficacy for TD completion. This observation reinforces the need to account for personal, contextual, and situational factors that can influence TD self-efficacy in SSA, ultimately influencing the attainment of degrees.

Existing literature consistently advocates for an enhancement in the rate of graduate degree attainment in SSA, mainly focusing on cultivating exemplary research skills among Ph.D. candidates, essential for roles in academia and research-intensive positions, including agricultural extension and leadership programs (Ferguson et al., 2018; Goujon et al., 2017; MacGregor, 2020). The presence of limited research expertise among prospective AGEDEX graduates in SSA threatens to widen the socioeconomic gap between the region and developed countries. Additionally, the absence of a proficient AGEDEX workforce in the future poses a significant challenge in finding suitable replacements for faculty members who transition or retire. As a result, AGEDEX programs may find themselves compelled to hire non-AGEDEX Ph.D. holders possessing the necessary research skills. This situation could lead to limited opportunities for AGEDEX graduates to secure positions, ultimately putting at risk the longstanding tradition of incorporating agricultural principles and perspectives into training and research within SSA.

In this context, agricultural colleges are urged to orient their academic pursuits towards addressing issues impacting global food and agriculture systems, emphasizing the pivotal role of well-prepared AGEDEX graduates in tackling these challenges.

Recommendations

Recommendations for Practice

AGEDEX graduate programs should undergo restructuring to enhance research skills and improve TD completion rates in universities across SSA, including those in developed countries. Considering the predictive significance of research knowledge, which encompasses the necessity for prior statistical and research experience, SSA's graduate programs should create more avenues for students to engage in statistical courses and hands-on research activities. This approach will foster mastery and bolster confidence among graduate students during the TD phase.

To achieve this, graduate-level training in SSA must incorporate comprehensive statistical and research methods courses, aiming to augment research, data analysis, and technical writing capabilities. Furthermore, Ph.D. students should receive research support to equip them with the essential skills for the timely completion of their studies. This support might encompass mentoring, coaching, and training tailored to assist them in navigating the challenges of PhD-level research. Advisors in graduate programs across SSA should identify the most impactful research, statistical modules, and professional development sessions, aligning their curricular efforts accordingly. Continual assessment of the sources of self-efficacy information by graduate faculty is crucial to ensure they cater to the diverse needs of all students, irrespective of gender.

The ubiquity of the Internet and technological advancements have facilitated access to information, presenting an opportunity to increase students' exposure to free online research analysis tools and writing resources (e.g., www.lynda.com, Weft QDA, PSPP – a free version of SPSS, ZOTERO, Mendeley, Academic Phrase bank, Grammarly). However, providing SSA's graduate students with simple online tools is not as straightforward as it may seem. Many of these students lack reliable Internet access and the requisite skills to utilize it effectively. Establishing graduate student research centers at SSA universities with stable Internet access, where students can research, advertise research opportunities, and gain hands-on research experience, could significantly enhance their research capabilities and proficiency in scientific and technical writing. This approach could subsequently elevate students' TD self-efficacy and graduation rates.

Finally, the SSA universities under examination in this study should contemplate establishing partnerships with international universities to leverage research and statistics education through virtual training platforms and participation in international conferences. Collaborative endeavors between institutions in both developed and developing nations could encompass joint grant applications that aim to furnish comprehensive graduate-level training support. This support might encompass scholarships for teaching and research assistants, meticulous supervision, and the provision of well-equipped workspaces. The financial resources stemming from these collaborations could be strategically allocated to offer access to relevant resources, including valuable free and affordable online research modules.

Recommendations for Future Research

Despite the response rate being deemed acceptable, the findings are limited to the universities that participated. Future researchers should replicate the study with larger samples of graduate students from more SSA universities to further confirm the results and increase the generalizability to the entire population of graduate students in SSA. Replicating the study could also shed additional light on how to increase graduate students' confidence in completing TD research in SSA. Future research should also explore the factors that contribute to low levels of research skills and self-efficacy among graduate students and identify effective strategies to enhance these skills and boost confidence in TD research. Researchers should consider exploring additional variables and using more sophisticated research techniques with larger sample sizes, such as logistic regression and structural equation modeling, to further understand how personal, contextual, and situational variables interact with the four primary efficacy sources to define graduate students' TD completion self-efficacy. Such research could contribute to advancing Bandura's social cognitive theory of self-efficacy to global audiences. Additionally, future researchers should consider using additional measures and developing a more comprehensive tool to help assess TD completion self-efficacy.

A qualitative study, engaging graduate students in a thoughtful discussion surrounding why they rated their TD completion so low, could help establish a more in-depth perspective on the precise research needs in SSA. Doing so would further inform future actions needed to improve TD completion in SSA. Without taking steps to further understand the reasons behind the low TD completion rates, graduates within SSA that hold advanced degrees will remain low, the gap between developed and developing nations will continue to increase, and the economies of SSA countries will continue to struggle and decline.

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