

The influence of scholarship funding on the participation of students in science, technology, engineering, and mathematics [STEM] doctoral programmes in selected universities in Kenya

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ABSTRACT

Scholarship funding plays a critical role in supporting doctoral education, particularly in resource-constrained higher education systems where the cost of advanced research training can limit access for many students. In developing countries such as Kenya, scholarships serve as a key mechanism through which universities and funding agencies expand access to doctoral education and strengthen research capacity in science, technology, engineering, and mathematics (STEM). This study examined the influence of scholarship funding on the participation of students in STEM doctoral programmes in selected universities in Kenya. The study was guided by Human Capital Theory and Resource Dependence Theory. The study adopted a convergent parallel mixed methods research design, combining quantitative survey data with qualitative insights from interviews and focus group discussions. Of 240 questionnaires distributed, 210 completed questionnaires were returned by STEM doctoral students (87.5%). Qualitative data were obtained from interviews with 10 key informants, comprising STEM departmental heads and doctoral programme coordinators, and two focus group discussions involving eight doctoral students each (16 students in total). Descriptive statistics were used to determine the prevalence of scholarship funding, and inferential analysis examined the relationship between scholarship support and students' participation in doctoral programmes. Qualitative data were analyzed using thematic analysis to explore students' experiences with scholarship funding. The findings revealed that scholarship funding significantly supports participation in STEM doctoral programmes by reducing financial barriers and enabling sustained academic engagement. Students who received scholarships reported greater ability to focus on research activities, meet programme milestones, and maintain consistent academic progress compared to those without financial support. Qualitative findings further showed that scholarships reduce financial stress, enhance motivation, and improve research productivity. The study concludes that expanding scholarship opportunities is essential for strengthening participation and retention in STEM doctoral programmes and for enhancing research capacity within Kenyan universities. The study recommends expanding scholarship opportunities, improving transparency of funding information, and prioritizing comprehensive support for research-intensive STEM doctoral programmes.

Keywords: Doctoral Funding, Higher Education Financing, Kenya, STEM Doctoral Education, Self-Financing, Student Participation

I. INTRODUCTION

Science, technology, engineering, and mathematics (STEM) education has become a central pillar for scientific advancement, technological innovation, and economic growth across the world. Modern economies increasingly depend on highly skilled scientists, engineers, and researchers who are capable of generating new knowledge and developing solutions to complex global challenges. Doctoral education represents the highest level of academic training and plays a crucial role in preparing researchers who contribute to scientific discovery, technological progress, and national development. As knowledge-driven economies expand, countries are placing greater emphasis on strengthening doctoral training in STEM disciplines to enhance research productivity and global competitiveness (National Science Foundation, 2020; United Nations Educational, Scientific, and Cultural Organization, 2022).

STEM fields are particularly important in the context of the Fourth Industrial Revolution, which is characterized by rapid technological transformation, digital innovation, and knowledge-intensive industries. Advances in areas such as artificial intelligence, biotechnology, data science, and advanced manufacturing require a workforce with strong scientific and technical expertise. As a result, investments in STEM education are widely viewed as essential for building human capital and supporting sustainable economic development (Li et al., 2020; Gurib-Fakim

& Signe, 2022). The growing importance of STEM skills has also been emphasized globally, as governments and international organizations seek to strengthen research capacity and technological innovation in response to evolving economic demands (United Nations, 2024).

Within this global context, doctoral education serves as a critical mechanism for developing advanced research capabilities. Doctoral programmes provide students with the opportunity to engage in original research, develop specialized expertise, and contribute to the creation of new scientific knowledge. The expansion of doctoral education has therefore become a strategic priority for many countries seeking to strengthen their innovation systems and research infrastructure (National Science Foundation, 2020). However, participation in doctoral programmes is influenced by several factors, including institutional support, research environment, supervision quality, and financial resources available to students.

Among these factors, financial support is one of the most significant determinants of doctoral participation and completion. Doctoral education often involves substantial costs related to tuition fees, research materials, laboratory equipment, fieldwork, conference participation, and living expenses. These financial demands can create significant barriers for students, particularly in resource-constrained contexts where funding opportunities are limited (National Center for Education Statistics, 2023). Scholarship funding, therefore, plays a crucial role in enabling students to pursue doctoral education by reducing financial constraints and providing the resources necessary to support research activities.

Empirical studies have consistently shown that financial support mechanisms such as scholarships, fellowships, and research assistantships influence doctoral students' academic engagement, persistence, and completion outcomes. Funding allows doctoral students to devote more time to research and academic development rather than balancing their studies with external employment obligations (Bekova, 2021). In addition, the type and stability of funding mechanisms can shape doctoral students' research experiences, skill development, and overall academic productivity (Blume-Kohout & Adhikari, 2019; Grote et al., 2021). Evidence further suggests that financial aid plays a significant role in promoting student persistence and degree attainment in higher education (Nguyen et al., 2019).

The importance of financial investment in education can also be understood through the lens of human capital theory, which views education and training as key investments that enhance individuals' productivity and economic value (Becker, 1964). From this perspective, supporting doctoral education through scholarships represents an investment in human capital development that contributes to scientific progress, technological innovation, and economic growth. Governments and institutions that allocate resources toward doctoral training are therefore investing in the development of a highly skilled workforce capable of advancing research and innovation systems (Donald et al., 2019; Winterton & Cafferkey, 2019).

In Africa, the development of strong STEM education systems has become a major priority due to the continent's growing need for scientific expertise and technological innovation. Many African countries are seeking to strengthen their research capacity in order to address development challenges related to health, agriculture, energy, climate change, and industrialization. Continental initiatives such as the African Union's Agenda 2063 emphasize the importance of expanding scientific research and developing highly skilled human capital to support Africa's long-term development goals (African Union, 2024). Similarly, institutions such as the African Academy of Sciences and the African Institute of Mathematical Sciences have been actively promoting scientific training, research collaboration, and capacity building across the continent (African Academy of Sciences, 2024; African Institute of Mathematical Sciences, 2024).

Despite these efforts, the development of doctoral education in many African countries continues to face significant challenges. Limited research infrastructure, inadequate funding, and shortages of experienced academic supervisors have constrained the expansion of doctoral programmes across the continent (Cloete et al., 2022). These challenges often affect both student enrollment and completion rates in doctoral programmes. Financial constraints, in particular, remain one of the most significant barriers limiting access to doctoral education in STEM fields.

In Kenya, strengthening science, technology, and innovation has become a national priority as the country seeks to build a knowledge-based economy. The national development strategy, Kenya Vision 2030, highlights the importance of research, innovation, and technological advancement in driving economic growth and improving the quality of life for citizens (Government of Kenya, 2024). Universities in Kenya have therefore increasingly expanded postgraduate programmes, particularly doctoral training in STEM disciplines, to develop the highly skilled researchers needed to support national development goals.

However, the expansion of doctoral education in Kenya has also revealed several structural and financial challenges affecting students' participation in STEM doctoral programmes. Research on doctoral education in Kenya indicates that many students face financial difficulties during their studies due to limited funding opportunities and the high costs associated with research activities (Ngome et al., 2020). These financial challenges may affect students' ability to enroll in doctoral programmes, maintain consistent academic engagement, and complete their studies within the expected timeframe. Scholarship funding, therefore, represents a critical mechanism for supporting doctoral

participation and research productivity in Kenyan universities. Scholarships provided by governments, universities, international organizations, and research institutions help reduce financial barriers and enable students to pursue advanced research training. By supporting doctoral students financially, scholarship programmes contribute to strengthening national research capacity and expanding the pool of highly trained STEM researchers.

Despite the recognized importance of scholarship funding, there remains limited empirical evidence on how scholarship support influences students' participation in STEM doctoral programmes within the Kenyan higher education context. While previous studies have examined broader challenges facing doctoral education in Africa, relatively little research has focused specifically on the relationship between scholarship funding and doctoral participation in STEM disciplines in Kenya. This study, therefore, seeks to examine the influence of scholarship funding on the participation of students in STEM doctoral programmes in selected universities in Kenya. By investigating how financial support affects doctoral students' engagement, research activities, and academic progression, the study aims to contribute to a better understanding of how funding mechanisms can strengthen doctoral education and enhance STEM research capacity in Kenyan universities.

This study, therefore, examines the influence of scholarship funding on the participation of students in STEM doctoral programmes in selected universities in Kenya. While previous studies have highlighted financial constraints in doctoral education, limited empirical evidence exists on how scholarship funding specifically shapes participation among STEM doctoral students in Kenyan universities. To address this gap, the study is guided by the following research question: What is the influence of scholarship funding on STEM doctoral students' participation in Kenyan universities?

1.1 Statement of the Problem

Science, technology, engineering, and mathematics (STEM) doctoral education is essential for building a highly skilled research workforce capable of advancing scientific innovation and supporting national development. Countries around the world are increasingly investing in STEM education to strengthen research capacity and respond to technological changes associated with the global knowledge economy (United Nations Educational, Scientific, and Cultural Organization, 2022). In Africa, strengthening doctoral training in STEM fields has become a strategic priority for improving scientific productivity and supporting sustainable development goals outlined in the African Union's Agenda 2063.

Despite these priorities, participation in STEM doctoral programmes in many African countries remains limited due to several structural and financial challenges. One of the most significant barriers is inadequate financial support for doctoral students. Doctoral education often requires substantial financial resources for tuition fees, research activities, laboratory equipment, and living expenses, which can discourage potential candidates from enrolling or continuing their studies (Ngome et al., 2020). Studies have also shown that financial constraints can negatively affect doctoral persistence, research productivity, and completion rates (Bekova, 2021; Nguyen et al., 2019).

In Kenya, universities have expanded postgraduate programmes in response to national development goals under Kenya Vision 2030, which emphasizes the importance of science, technology, and innovation. However, many doctoral students still face limited access to scholarship funding, which may affect their participation and academic progress in STEM doctoral programmes. Despite the growing importance of financial support in doctoral education, limited empirical research has examined how scholarship funding influences students' participation in STEM doctoral programmes in Kenyan universities. This gap highlights the need to investigate the relationship between scholarship funding and doctoral participation in STEM fields.

1.2 Research Objectives

1. To examine the influence of scholarship funding on students' participation in STEM doctoral programmes in selected universities in Kenya, with particular focus on how financial support affects access to doctoral education, academic engagement, progression, and overall participation patterns among doctoral students.

II. LITERATURE REVIEW

2.1 Theoretical Review

This study is guided by Human Capital Theory and Resource Dependence Theory, which provide a useful framework for understanding the relationship between scholarship funding and participation in STEM doctoral programmes.

Human Capital Theory explains how investments in education and training enhance individuals' knowledge, skills, and productivity, which ultimately contribute to economic growth and societal development. The theory was originally developed by Gary S. Becker, who argued that education should be viewed as an investment that improves individuals' capacity to contribute productively to the economy (Becker, 1964). Within the context of doctoral

education, scholarship funding is an investment in human capital because it supports the development of highly skilled researchers and scientists. By providing financial support to doctoral students, governments and institutions help individuals acquire advanced knowledge and research skills that are critical for innovation, technological development, and knowledge creation.

In STEM fields, the importance of investing in human capital is particularly significant because scientific research and technological development require specialized expertise and advanced training. Countries that invest in STEM doctoral education are better positioned to develop strong research systems and improve their global competitiveness in science and technology. Financial support mechanisms such as scholarships, fellowships, and research grants enable students to focus on research activities and skill development, thereby strengthening their academic engagement and productivity (Donald et al., 2019; Winterton & Cafferkey, 2019). In this study, Human Capital Theory explains why scholarship funding may influence students' participation in STEM doctoral programmes by reducing financial barriers and facilitating investment in advanced education.

The second theoretical perspective informing this study is Resource Dependence Theory. This theory, developed by Jeffrey Pfeffer and Gerald R. Salancik, emphasizes that organizations depend on external resources to survive and achieve their goals (Pfeffer & Salancik, 1978). In higher education systems, universities rely on various forms of external funding, such as government grants, research funding, and scholarship programmes, to support academic activities and research training. According to Resource Dependence Theory, access to financial resources significantly influences organizational behaviour and outcomes because institutions must secure adequate resources to sustain their operations and programmes.

In the context of doctoral education, scholarship funding represents a critical external resource that supports students' academic participation and research activities. Universities that provide adequate financial support through scholarships and fellowships are more likely to attract and retain doctoral students, particularly in resource-intensive fields such as STEM. Conversely, limited access to financial resources can constrain students' ability to participate fully in doctoral programmes and may lead to delayed completion or attrition. Resource Dependence Theory, therefore, provides a useful lens for understanding how financial resources influence participation and sustainability within doctoral education systems (Hillman et al., 2009; Davis & Cobb, 2010).

Together, Human Capital Theory and Resource Dependence Theory provide complementary perspectives for examining the influence of scholarship funding on participation in STEM doctoral programmes. While Human Capital Theory emphasizes the role of educational investment in developing highly skilled researchers, Resource Dependence Theory highlights the importance of financial resources in supporting academic institutions and student participation. These theoretical perspectives help explain why scholarship funding is a critical factor influencing students' engagement, persistence, and participation in doctoral education.

2.2 Empirical Review

A growing body of research has examined factors influencing participation, persistence, and completion in doctoral education, particularly in STEM disciplines. Previous studies indicate that financial support is one of the most important determinants of doctoral students' academic engagement and progress. Research has shown that scholarship funding plays a significant role in enabling students to pursue doctoral education by reducing financial barriers associated with tuition, research expenses, and living costs. A systematic review conducted by Nguyen et al. (2019) found that financial aid positively influences student persistence and degree completion in higher education. Students who receive adequate funding are more likely to remain enrolled and complete their academic programmes compared to those who lack financial support. Similarly, Blume-Kohout and Adhikari (2019) examined the impact of different funding mechanisms on the training of the scientific workforce. They found that funding support significantly affects doctoral students' research productivity and career outcomes. Their study demonstrated that students who receive stable financial support are better able to focus on research activities, develop professional skills, and complete their doctoral programmes.

Studies focusing specifically on doctoral students also highlight the role of financial stability in improving academic outcomes. Bekova (2021) found that doctoral students who engage in external employment due to financial constraints often experience delays in completing their programmes. The study suggests that insufficient financial support may reduce the amount of time students can dedicate to research activities, thereby affecting their academic progress. In STEM fields, the nature of research activities often requires additional financial resources for laboratory experiments, specialized equipment, and data collection. As a result, access to adequate funding is particularly important for students enrolled in STEM doctoral programmes. Research conducted by Grote et al. (2021) indicates that funding mechanisms significantly influence doctoral students' skill development, research engagement, and overall academic experience.

In the African context, doctoral education faces additional challenges related to limited funding opportunities, inadequate research infrastructure, and shortages of experienced supervisors. Cloete et al. (2022) note that many African universities struggle to provide sufficient financial support for doctoral students, which affects both

participation and completion rates. Similarly, Ngome et al. (2020) report that financial constraints remain a major challenge affecting doctoral education in Kenyan universities, with many students relying heavily on scholarships to sustain their studies. Taken together, the reviewed literature suggests that scholarship funding can influence participation by easing financial constraints, supporting research engagement, and sustaining academic progression. However, evidence specifically examining this influence among STEM doctoral students in Kenyan universities remains limited. This study addressed that gap by examining the influence of scholarship funding on students' participation in selected Kenyan universities.

III. METHODOLOGY

3.1 Research Design

This study adopted a convergent parallel mixed methods research design to examine the influence of scholarship funding on students' participation in STEM doctoral programmes in selected universities in Kenya. Mixed methods research integrates both quantitative and qualitative approaches in a single study to provide a more comprehensive understanding of the research problem (Creswell & Plano Clark, 2018). The approach enables the researcher to collect numerical data that can be statistically analyzed while also obtaining qualitative insights that help explain participants' experiences and perspectives. The use of a mixed methods design was considered appropriate for this study because the research sought to measure the relationship between scholarship funding and participation in STEM doctoral programmes while also understanding the experiences of doctoral students regarding funding support. Quantitative data were used to determine patterns and relationships between scholarship funding and student participation. In contrast, qualitative data provided deeper explanations of how financial support influences doctoral students' academic engagement and progression. The two strands were conducted in parallel during the same study phase, analyzed separately, and integrated when interpreting their convergences and divergences. According to Creswell and Creswell (2022), mixed methods research enhances the validity and reliability of research findings by allowing the researcher to triangulate data from different sources. This design, therefore, enabled the study to generate more comprehensive evidence regarding the role of scholarship funding in supporting participation in STEM doctoral programmes.

3.2 Study Area

The study was conducted in selected universities in Kenya offering STEM doctoral programmes. Kenya has experienced significant growth in postgraduate education as universities expand their doctoral programmes to strengthen research capacity and support national development goals. The expansion of STEM education in the country aligns with the national development strategy outlined in Kenya Vision 2030, which emphasizes the role of science, technology, and innovation in promoting economic growth and technological advancement. The selected universities included institutions that offer doctoral programmes in STEM disciplines and have enrolled doctoral students who may receive different forms of scholarship funding. These institutions provide an appropriate context for examining how financial support influences participation in STEM doctoral programmes.

3.3 Target Population

The target population for this study comprised approximately 460 doctoral students enrolled in STEM programmes in selected universities in Kenya, together with STEM departmental heads and doctoral programme coordinators who provided institutional perspectives. These students represent the group most directly affected by scholarship funding policies and financial support mechanisms within doctoral education. The population included students from various STEM disciplines, such as science, engineering, technology, and mathematics, who were actively pursuing doctoral studies during the period of the study. These students were selected because they are directly involved in research activities that often require financial resources for laboratory work, field research, data collection, and conference participation. STEM departmental heads and doctoral programme coordinators were included because of their roles in doctoral training and their knowledge of scholarship administration and student participation.

3.4 Sample Size and Sampling Techniques

The quantitative target population consisted of approximately 460 doctoral students enrolled in STEM programmes across the selected universities during the period of the study. The minimum required quantitative sample size of 210 completed questionnaires was determined using the sample size determination table developed by Krejcie and Morgan (1970), which provides recommended sample sizes for different population levels in social science research. To allow for nonresponse, 240 doctoral students were selected for questionnaire distribution; 210 returned completed questionnaires (87.5%) and formed the final analyzed quantitative sample. A combination of stratified sampling and simple random sampling techniques was used to select participants for the study. Stratified sampling was

first applied to ensure adequate representation of doctoral students from the participating universities and from major STEM disciplines, including science, engineering, technology, and mathematics. Each university and discipline formed a stratum, and participants were proportionally selected based on the number of doctoral students within each group. Within each stratum, simple random sampling was then used to select students for questionnaire distribution, giving all eligible doctoral students an equal chance of being included in the study. This sampling approach helped improve the representativeness of the sample and minimized sampling bias. For the qualitative strand, 10 key informants comprising STEM departmental heads and doctoral programme coordinators were selected purposively for interviews, and 16 doctoral students participated in two focus group discussions of eight students each. These qualitative participants were considered separately from the minimum questionnaire sample size.

3.5 Data Collection Methods

Data for the study were collected using questionnaires, semi-structured interviews, and focus group discussions. The questionnaire was used to collect quantitative data from doctoral students regarding scholarship funding, financial challenges, and their level of participation in STEM doctoral programmes. A total of 240 questionnaires were distributed to doctoral students across the selected universities to account for possible nonresponse beyond the minimum required sample of 210; 210 completed questionnaires were returned and analyzed, representing a response rate of 87.5%. This response rate was considered adequate for statistical analysis and helped minimize the risk of non-response bias. Questionnaires are widely used in educational research because they allow researchers to collect data from a large number of respondents in a structured and efficient manner (Saunders et al., 2019). Qualitative data were collected through semi-structured interviews and focus group discussions. A total of 10 key informants, including STEM departmental heads and doctoral programme coordinators, were purposively selected based on their experience with doctoral training and scholarship administration. In addition, two focus group discussions consisting of eight STEM doctoral students each (16 participants in total) were conducted to explore students' experiences with scholarship funding and its influence on their participation in doctoral programmes. The combination of questionnaires, interviews, and focus group discussions enabled the study to gather both quantitative and qualitative data and provided a more comprehensive understanding of the research problem.

3.6 Data Analysis

Quantitative data collected through questionnaires were analyzed using descriptive and inferential statistical techniques. Descriptive statistics such as frequencies, percentages, means, and standard deviations were used to summarize the characteristics of the respondents and their responses regarding scholarship funding and participation in doctoral programmes. Inferential statistical analysis was used to examine the relationship between scholarship funding and participation in STEM doctoral programmes. Qualitative data obtained from interviews and focus group discussions were analyzed using thematic analysis, a method that involves identifying, analyzing, and reporting patterns or themes within qualitative data. Thematic analysis allows researchers to organize and interpret participants' experiences and perspectives in a systematic manner (Braun & Clarke, 2006). Quantitative and qualitative results were initially analyzed separately and then compared and integrated to identify convergent and divergent findings, as reported in Section 4.5.

3.7 Validity and Reliability

To ensure the quality of the research instruments, the study considered both validity and reliability. Validity refers to the extent to which a research instrument accurately measures what it is intended to measure. The questionnaire and interview guide were reviewed to ensure that the questions were relevant to the objectives of the study and adequately captured information related to scholarship funding and doctoral participation. Reliability refers to the consistency of a research instrument in producing stable and consistent results when used repeatedly under similar conditions. Reliability of the questionnaire was assessed through careful design and testing of the survey instrument to ensure clarity and consistency of the questions. Ensuring validity and reliability helped improve the credibility and accuracy of the research findings.

3.8 Ethical Considerations

Ethical considerations were observed throughout the research process to ensure that the rights and well-being of participants were protected. Participation in the study was voluntary, and respondents were informed about the purpose of the research before data collection. Participants were assured that the information they provided would be treated with confidentiality and used only for academic purposes. In addition, participants were allowed to withdraw from the study at any stage if they wished. These ethical measures ensured that the research was conducted responsibly and in accordance with accepted standards of academic research.

IV. FINDINGS & DISCUSSION

4.1 Descriptive Statistics on Scholarship Receipt Status

This section examines the extent to which respondents reported receiving scholarships to support their STEM doctoral studies. Scholarships in this context included partial and full tuition coverage from government agencies, private foundations, university-sponsored schemes, and international donors. Table 1 summarizes the frequency and percentage distribution of respondents by scholarship receipt status.

Table 1

Descriptive Statistics on Scholarship-Based Funding

Scholarship Type	Frequency	Percentage (%)
Partial Grant	155	73.81
Full Scholarship	113	53.81
Received at least one form of Scholarship	128	60.95

Note: The categories in this table are not mutually exclusive. Some respondents reported receiving both partial grants and full scholarships at different stages of their doctoral studies or through combined funding arrangements. As a result, percentages may exceed 100% when aggregated.

The data on scholarship support among STEM doctoral students reveal important trends concerning the distribution and reach of funding opportunities. Out of the total sample of 210 respondents, 73.81% received a partial grant, while 53.81% obtained a full scholarship. Notably, 60.95% of the respondents reported having received at least one form of scholarship, whether partial, full, or a combination of both. This suggests that while a majority of students had some exposure to scholarship support, the intensity and sufficiency of such support likely vary considerably. The overlap between partial and full scholarships indicates that some students benefited from both forms of assistance. This pattern may reflect institutional or donor strategies aimed at combining limited funding streams to broaden access rather than providing full coverage to a smaller number of recipients. The fact that nearly two-fifths (39.05%) of doctoral students had not received any form of scholarship is significant. This subgroup likely relies on self-financing mechanisms, including personal savings, loans, or family support.

The implications of this funding gap are substantial, as self-funded doctoral candidates may encounter financial strain that affects their ability to engage in research fully, participate in academic events, or complete their programmes on schedule. Moreover, the relatively high proportion of students benefitting from partial grants may signal either limited availability of full funding or a perception among sponsors that partial assistance is more feasible and equitable. This could also point to systemic factors where institutions or donors prioritize wider but shallower financial support. Overall, the statistics underscore a heterogeneous funding environment that influences the participation experience of STEM doctoral students. As Cloete et al. (2022) observed, African doctoral systems are characterized by uneven and unpredictable funding structures, which lead to disparities in access, retention, and completion. Breier and Herman (2017) similarly found that partial grants, while well-intentioned, often fail to offset the full range of expenses, especially for STEM students whose research activities may demand travel, lab materials, or specialized equipment. The variability in grant structure thus plays a key role in shaping participation outcomes.

4.2 Scholarship Funding Across Demographic Variables

Table 2 presents the distribution of scholarship receipt across key demographic variables, specifically gender, age group, field of study, and academic year. The table provides both percentage distributions and chi-square test results to determine whether the observed differences are statistically significant. This section interprets these findings to assess whether access to scholarship support, whether partial or full, is equitably distributed among various categories of students enrolled in STEM doctoral programmes.

Table 2

Chi-Square Test Results Showing Distribution of Scholarship-based Funding across Demographic Variables

Demographic Variable	Type of Scholarship	% Reporting Yes (for each demographic variable)	χ^2 (df)	p-value
Gender				
Male	Partial grant	25.6%	0.048 (1)	.826
Female	Partial grant	27.0%		
Male	Full scholarship	46.3%	0.001 (1)	.976
Female	Full scholarship	46.1%		

Age Group				
18-30	Partial grant	20.0%	3.948 (4)	.413
31-35	Partial grant	29.2%		
36-40	Partial grant	19.1%		
41-45	Partial grant	35.3%		
Above 45	Partial grant	25.0%		
18-30	Full scholarship	55.0%	5.248 (4)	.263
31-35	Full scholarship	33.3%		
36-40	Full scholarship	48.9%		
41-45	Full scholarship	37.3%		
Above 45	Full scholarship	52.9%		
Field of Study				
Pure and Applied Sciences	Partial grant	26.3%	3.252 (3)	.354
Technology	Partial grant	17.0%		
Engineering	Partial grant	32.7%		
Mathematics	Partial grant	27.8%		
Pure and Applied Sciences	Full scholarship	43.9%	4.791 (3)	.188
Technology	Full scholarship	36.2%		
Engineering	Full scholarship	57.7%		
Mathematics	Full scholarship	46.3%		
Academic Year				
Year 1	Partial grant	18.5%	2.964 (2)	.227
Year 2	Partial grant	28.9%		
Year 3	Partial grant	30.6%		
Year 1	Full scholarship	46.2%	3.617 (2)	.164
Year 2	Full scholarship	53.0%		
Year 3	Full scholarship	37.1%		

It is important to emphasize that none of the observed differences across demographic variables reached statistical significance at the 0.05 level. Therefore, the proportional variations observed across categories should be interpreted cautiously, as they may reflect random variation rather than systematic differences in scholarship allocation.

The distribution of scholarship awards across gender categories indicates a minimal difference between male and female recipients. Specifically, 25.6% of male students reported receiving a partial grant compared to 27.0% of female students. For full scholarships, the proportions were nearly identical: 46.3% for males and 46.1% for females. The chi-square tests for both partial grant ($\chi^2 (1) = 0.048$, $p = .826$) and full scholarship ($\chi^2 (1) = 0.001$, $p = .976$) revealed no statistically significant association between gender and scholarship receipt. These results suggest that gender does not play a discernible role in determining access to either partial or full scholarship funding among STEM doctoral students in the sampled institutions. The parity in distribution indicates that, at least from a gender perspective, scholarship access appears to be equitably administered.

Turning to age groups, the receipt of partial grants varied, with students aged 41–45 reporting the highest uptake at 35.3%, while those in the 36–40 age range had the lowest at 19.1%. Meanwhile, the full scholarship receipt was highest among the youngest group (18–30 years) at 55.0%, followed by those above 45 years at 52.9%. Students aged 31–35 were the least likely to receive full scholarships, with only 33.3% reporting such support. Despite these differences in proportions, the chi-square test results for both partial grant ($\chi^2 (4) = 3.948$, $p = .413$) and full scholarship ($\chi^2 (4) = 5.248$, $p = .263$) were not statistically significant. This indicates that while there are visible age-related disparities in scholarship distribution, these differences are not strong enough to suggest a systematic pattern based on age. However, the relatively higher access among the youngest cohort may point to a possible prioritization of early-career scholars by funding agencies or scholarship committees, even if this trend is not statistically definitive.

When examined across fields of study, the highest proportion of partial grant recipients was observed in Engineering (32.7%), while Technology students reported the lowest at 17.0%. For full scholarships, engineering again recorded the highest share at 57.7%, with Technology students receiving the least at 36.2%. Mathematics and Pure and Applied Sciences fell in between these extremes. Chi-square test results, however, indicated that these observed differences were not statistically significant for either partial grant ($\chi^2 (3) = 3.252$, $p = .354$) or full scholarship ($\chi^2 (3) = 4.791$, $p = .188$). Although the data do not show a significant association, the higher proportions among engineering students reflect stronger industry partnerships or more generous research funding aligned with engineering projects. Conversely, the relatively lower proportions in Technology could signify either lower demand or reduced visibility of funding opportunities within that field.

Analysis by academic year showed that third-year students reported the highest proportion of partial grant recipients (30.6%), followed by second-year students (28.9%), while first-year students had the lowest proportion (18.5%). In contrast, full scholarships were most common among first-year students (46.2%) and least common among those in their third year (37.1%). Although these percentages suggest that comprehensive funding may be more accessible at the beginning of the doctoral programme, the chi-square tests for both partial grants ($\chi^2(2) = 2.964$, $p = .227$) and full scholarships ($\chi^2(2) = 3.617$, $p = .164$) revealed no statistically significant association between academic year and scholarship type. This implies that variation in scholarship distribution across academic years is not systematic but rather random.

Overall, the lack of statistically significant associations across all demographic categories suggests that scholarship allocation practices are not evidently biased along these lines. This uniformity may be the result of formalized and transparent criteria employed by scholarship committees or institutional policies designed to promote equitable access, aligning with the positive impacts of structured funding shown by Graddy-Reed et al. (2021) and Nguyen et al. (2019). However, the presence of proportional differences, particularly among fields of study and age cohorts, should not be overlooked. The absence of statistical significance does not mean the observed proportional differences are irrelevant.

These differences are plausible signals of discipline-linked funding ecosystems and stage-of-study dynamics that may not register strongly in a chi-square test, especially where categories are small or where scholarship definitions include mixed funding streams. For example, relatively higher proportions in Engineering could reflect stronger project-linked funding structures, while lower proportions in Technology could reflect fewer earmarked scholarships or weaker alignment with sponsor priorities. These are not claims of causal effects, but reasoned explanations that help contextualize the patterns. They also align with concerns about social inclusion and how funding structures can indirectly shape who benefits from doctoral opportunities, even without explicit demographic targeting (Rossello, 2023).

4.3 Relationship between Scholarship Funding and Participation in STEM Doctoral Programmes

This section evaluates whether participation in STEM doctoral programmes differs significantly between students who received scholarship support and those who did not. Participation was assessed using a composite score based on multiple Likert-scale indicators related to engagement in coursework, research, and academic activities. An independent samples t-test was conducted to determine whether the observed difference in mean participation scores between the two groups was statistically significant. Table 3 displays the results of this test.

Table 3

Independent Samples t-Test Comparing Level of Participation in STEM Doctoral Programmes by Scholarship Funding

Group	<i>N</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>df</i>	<i>p</i>	<i>MD</i>	<i>95% CI for MD</i>
Did not receive a scholarship	82	4.54	0.38					
Received at least one form of scholarship	128	4.57	0.43	-4.58	208	<.001	-0.03	[-0.36, -0.13]

Note: M=Mean; SD=Standard deviation; MD=Mean difference. Levene's test for equality of variances: $F(1, 208) = 4.63$, $p=.053$

As shown in Table 3, the Levene's test for equality of variances was not significant, $F(1, 208) = 0.424$, $p = .054$, indicating that the assumption of equal variances was met, and the pooled variance estimate could be used in the t-test. The results also revealed a statistically significant difference in participation scores between students who received scholarship funding and those who did not, $t(208) = -4.58$, $p < .001$. Although the statistical test indicates a significant difference between the two groups, the magnitude of the mean difference (0.03) is relatively small. This suggests that while scholarship funding is associated with higher participation scores, the practical difference in the quantitative measure alone may be modest. However, the qualitative findings provide richer evidence of the ways in which scholarship funding influences doctoral participation, particularly through enhanced academic focus, reduced financial stress, and increased motivation. These qualitative insights help contextualize the statistical findings and demonstrate that the impact of scholarships extends beyond what is captured in the numerical participation score.

Students who received at least one form of scholarship reported a slightly higher mean participation score ($M = 4.57$, $SD = 0.43$) than those who did not receive any scholarship ($M = 4.54$, $SD = 0.38$). The mean difference ($MD = -0.03$) was small but statistically significant, with a 95% confidence interval ranging from -0.36 to -0.13, which excludes zero and confirms the robustness of the difference. Based on these findings, the null hypothesis (H_{02}), which stated that there is no significant difference in participation in STEM doctoral programmes between students who received scholarship funding and those who did not, was rejected. The reported result indicates a positive association

between scholarship funding and participation, although the small mean difference suggests that the practical effect should be interpreted cautiously. This pattern is consistent with Donald et al. (2019), who found that financial support can enable doctoral students to devote more time to research. In this study, scholarship support appears to strengthen continuity by reducing the need for external income generation and helping students maintain attention to research and programme milestones.

Continuity matters in doctoral training because progress depends on sustained access to supervision, research infrastructure, and uninterrupted time for complex tasks such as experiments, fieldwork, and academic writing. While both groups showed relatively high engagement, the statistically significant advantage for scholarship recipients affirms the critical role of structured financial support in fostering robust doctoral participation in STEM fields, a conclusion strongly supported by Graddy-Reed et al. (2021), Nguyen et al. (2019), and Belavy et al. (2020) who demonstrated the positive impact of scholarships on completion rates, persistence, and research productivity.

4.4 Thematic Analysis of the Influence of Scholarship Funding on Participation in STEM Doctoral Programmes

The thematic analysis aimed to explore the perceived impact of scholarship funding on student participation in STEM doctoral programmes within selected public and private universities in Kenya. Through interviews with key informants and focus group discussions with STEM doctoral students, recurring patterns and themes were identified to complement and contextualize the quantitative findings. The analysis focused exclusively on experiences and perspectives related to scholarships, particularly their role in facilitating access, retention, engagement, and completion. This section presents the key themes that emerged, offering deeper insight into how scholarship funding shapes participation in doctoral education.

4.4.1 Entry into Doctoral Study

One of the most consistent patterns to emerge from participant narratives was the critical role of scholarship financing in enabling access to doctoral education. For many, the availability of financial support was not merely an incentive but an essential prerequisite to enrollment. Participants frequently emphasized that without scholarships, especially full awards, they would not have commenced doctoral studies due to the prohibitive costs. This insight underscores the gatekeeping function of scholarship financing, which effectively determines who can access the pathway to advanced STEM education.

“Honestly, I had shelved the idea of pursuing a PhD for years. It was only after I got a full scholarship that it became possible. Without it, I wouldn't have applied at all,” (Participant B on 4th March, 2026)

This account reflects a broader trend across the dataset: financial barriers are not abstract concerns but concrete determinants of educational access. In contrast to self-financed students, scholarship recipients entered the programme under less financial duress, allowing them to make academic decisions based on interest and long-term career planning rather than affordability. This dynamic reveals how funding influences not only access but also the trajectory of academic engagement from the outset. The data further indicate that scholarship access is often aligned with prior academic excellence or affiliation with research networks, creating stratified entry points. Those who had earlier connections to donor agencies, faculty mentors, or international research networks reported a smoother transition into doctoral education. This creates an implicit filtering mechanism where access to information and institutional gatekeepers determines who can navigate toward scholarship opportunities. As *Key Informant 1* put it:

“In most cases, we notice that students who receive scholarships have strong institutional linkages. Either they worked on funded projects or had prior exposure to research grant systems. It's rarely random.” (Key Informant 1 on 4th March, 2026)

Such observations highlight an unequal terrain of access. While the presence of scholarships enables entry, their distribution is mediated by prior institutional privilege or exposure. This reinforces concerns around equity and inclusivity in doctoral education, particularly within STEM fields, where opportunities often concentrate among a select group of students with better academic and professional networks. For some participants, scholarship awards arrived unexpectedly, altering their academic decisions in significant ways. One respondent described how he had initially declined a doctoral offer due to financial limitations but reversed his decision after receiving a late award notification.

“I had declined the offer already because I couldn't afford the fees. But then the department called back and said I was selected for a scholarship. That changed everything,” (Participant M, 4th March, 2026)

This illustrates the time-sensitive and transformative role of scholarships in determining academic choices. The moment of award becomes a pivotal juncture in students' academic lives, underscoring the precariousness of access in the absence of financial aid. Moreover, the retrospective reflections suggest that without scholarship financing, several capable candidates would have remained outside the academic pipeline entirely. A few respondents recounted stories where peers, despite being qualified, never enrolled because they were unsuccessful in securing funding. These stories reflect the existence of a silent dropout or “non-entry” group, individuals whose participation was curtailed even before it could begin. *Key Informant 2*, an administrator in a STEM doctoral programme, noted:

“Every year, we turn away highly qualified applicants who simply can't afford the tuition. Scholarships are limited, and once the few are awarded, others disappear quietly.” (Administrator, 4th March, 2026)

This systemic shortfall emphasizes the structural dependence of doctoral access on external funding mechanisms. The meritocratic assumption that talent alone determines doctoral participation is disrupted by the financial stratification embedded in the process. Although entrance criteria may appear neutral, they interact with economic capital in ways that perpetuate inequality. In several cases, the psychological framing of scholarship receipt was also deeply influential. Scholarship recipients often described their awards not just as financial support but as validation of their worthiness and potential. For many, the recognition associated with receiving a competitive scholarship heightened their academic confidence and shaped their initial identity as doctoral scholars. As *Participant T* reflected:

“Receiving the scholarship made me feel like I belonged. Like I was chosen because I could contribute something meaningful to the field.” (Participant T, 5th March, 2026).

This affective dimension is vital. The transition into doctoral study is not only academic and financial but also psychological. Scholarship receipt functions as a form of symbolic capital, reinforcing feelings of competence and legitimacy. For early-stage doctoral students, especially those from underrepresented backgrounds, such affirmation can be decisive in shaping initial academic engagement. However, the analysis also revealed disparities between partial and full scholarship recipients. While both groups gained access, those with partial grants reported ongoing uncertainty about how to manage the remaining costs. This often introduced hesitation in enrollment decisions, with some accepting the offer only after securing loans or additional income sources. Thus, the type of scholarship awarded materially influenced the nature of academic entry. *Participant K*, who received a partial grant, shared:

“The partial scholarship was helpful, but I still had to think long and hard about joining. I knew I'd need to take up extra work to cover the rest, and that delayed my decision.” (Participant K, 5th March, 2026).

Such cases illuminate the nuances in financial accessibility. Full scholarships offered a clear pathway, while partial awards introduced conditionality into the decision-making process. Consequently, while both may be categorized under “scholarship financing,” their impact on participation varies substantially. It is crucial to distinguish between the types of support when assessing access to doctoral education. Furthermore, regional disparities emerged in the narratives. Participants from remote or marginalized areas reported facing additional obstacles in accessing information about available scholarships. For them, the path to scholarship-enabled participation involved navigating structural blind spots in communication and outreach. As *Participant E* observed:

“Where I come from, we don't even hear about these scholarships until it's too late. There's a lot of talented people who miss out just because of lack of access to information.” (Participant E, 5th March, 2026).

This suggests that even before formal application processes begin, inequalities in access to opportunity information filter out large segments of the population. Hence, the question of entry into doctoral study via scholarship financing cannot be detached from broader socioeconomic and spatial inequities. In conclusion, the theme of entry into doctoral study reveals that scholarship financing is a decisive factor in determining who gains access to STEM doctoral programmes. It affects more than affordability; it shapes identity, self-perception, timing, and the ability to plan long-term, thereby critically influencing the decision to enroll and persist. This aligns with findings by Wollast et al. (2018) and Nguyen et al. (2019), who demonstrated the significant positive impact of financial aid on doctoral persistence and degree attainment. Understanding this layered role of scholarships is essential in framing participation as a function not only of academic readiness but also of financial access, institutional visibility, and psychological preparedness, especially given concerns raised by Rossello (2023) regarding how scholarship cuts can negatively impact overall participation rates and social inclusion for non-traditional students.

4.4.2 Enhanced Academic Focus

Scholarship financing was consistently linked to improved academic concentration among recipients, allowing them to fully immerse themselves in their doctoral studies without the constant distractions of financial uncertainty. Participants frequently emphasized that scholarships, particularly full awards, created a stable environment in which they could focus exclusively on their research and academic responsibilities. In this regard, scholarships functioned not only as financial support but as enablers of intellectual engagement and productivity.

“Knowing that my fees and living expenses were covered gave me the peace of mind to fully dedicate myself to my work. I didn't have to think about side jobs or fundraising,” (Participant R, a second-year doctoral candidate, 5th March, 2026).

This sentiment was echoed by several respondents who contrasted their experience with that of peers who lacked funding or relied on partial support. These unfunded or underfunded students often had to juggle multiple responsibilities, including part-time employment or family obligations, which diluted their academic engagement. In contrast, scholarship recipients described being able to structure their schedules around academic milestones, spend more time in labs, and attend conferences and seminars without financial hesitation. Furthermore, the absence of

financial anxiety facilitated deeper engagement with research, especially in fields requiring time-intensive data collection, experimentation, or computational modeling. *Participant L*, who was working on an energy systems modeling project, noted:

"Because I had the scholarship, I could spend more time refining my simulations and running long experiments without worrying about paying rent or tuition. It made a huge difference in the quality of my work."(Participant L, 6th March, 2026).

This observation points to a direct link between funding and the caliber of research output. In STEM fields, where rigorous experimentation and sustained intellectual effort are required, uninterrupted focus is critical. The financial buffer provided by scholarships ensured that recipients were not forced to compromise their academic performance for economic survival. The testimonies also reveal that scholarship-funded students were more likely to engage in supplementary academic activities that enhanced their scholarly development. Attendance at conferences, publication workshops, or short-term research exchanges was often facilitated by scholarship provisions or linked funding. *Key Informant 4*, a senior academic and doctoral supervisor, observed:

"You'll notice that the students with scholarships are the ones publishing more, attending workshops, and presenting at international fora. They can take those opportunities because they're not worried about every shilling."(Key Informant 4, 5th March, 2026).

This linkage between funding and enhanced academic exposure suggests that scholarships do more than cover basic tuition; they expand the academic horizon of doctoral students, contributing to both professional development and scholarly visibility. For some participants, the exposure also contributed to more ambitious research goals and a stronger alignment with global scientific communities. Another key dimension that emerged from the narratives was the mental clarity and cognitive stability that came with scholarship support. Several students spoke about the psychological toll that financial insecurity can take, particularly in a high-pressure academic environment. *Participant Y*, a doctoral student in environmental science, reflected:

"Before the scholarship, I was constantly stressed. It affected my ability to concentrate. After the funding came in, it was like a fog lifted. I could finally think clearly and do real work."(Participant Y, 6th March, 2026).

Such reflections highlight the intersection between financial well-being and cognitive function. Doctoral education demands sustained mental effort, and scholarship financing can be seen as an investment in a student's ability to sustain that effort. While often framed in economic terms, the benefits of scholarships extend to the mental, emotional, and intellectual spheres, supporting a more holistic academic performance. Notably, some participants who received partial scholarships expressed a contrasting experience. Although they benefited from some support, they still encountered difficulties in maintaining academic focus due to the need to secure additional income. These students reported periods of inconsistency in their research activity, particularly during times when they were actively seeking supplementary funds. *Participant G* remarked:

"I had a partial grant, which helped with tuition, but I still had to freelance and teach part-time. It's not the same. There were weeks I just couldn't work on my thesis because I was too exhausted."(Participant G, 6th March, 2026).

This contrast between full and partial funding underscores the unequal outcomes even within the category of scholarship recipients. While all scholarships offer some relief, the extent of support matters significantly. Full scholarships allow students to immerse themselves fully in academic life, whereas partial scholarships may still leave them vulnerable to the disruptions associated with financial shortfalls. In several cases, full scholarship recipients noted that the assurance of continuous support across multiple years allowed for long-term academic planning. This stability facilitated strategic decisions such as planning multi-phase studies, pursuing international collaborations, or designing interdisciplinary research with extended timelines. As *Participant N* put it:

"Because I knew the funding was there for four years, I designed a more complex project. It gave me the freedom to be more ambitious in my research."(Participant N, 6th March, 2026).

Such strategic latitude is rarely available to unfunded or precariously funded students, who often adopt more conservative research designs to minimize risk. The data suggest that scholarship financing not only enhances focus in the day-to-day academic process but also expands the intellectual scope of doctoral research itself. Finally, there was a broader affective dimension to this theme: many participants framed their ability to focus as a form of academic dignity. They spoke of feeling respected and valued as scholars because they were given the space to pursue their research without distraction. *Key Informant 3*, a doctoral programme coordinator, captured this perspective succinctly:

"When we fund students properly, we're not just helping them pay bills—we're telling them their work matters. That they deserve the chance to concentrate and succeed."(Key Informant 3, 6th March, 2026)

In summary, the theme of enhanced academic focus illustrates that scholarship financing plays a foundational role in enabling doctoral students to engage deeply with their academic responsibilities. By reducing or eliminating financial distractions, scholarships allow for more consistent research output, participation in scholarly communities, and long-term academic planning. The findings reveal that the impact of scholarships goes far beyond economics,

influencing intellectual productivity, mental health, and professional identity. In the broader landscape of STEM doctoral education, adequate scholarship funding emerges as a critical lever for academic excellence and equitable participation.

4.4.3 Motivational Uplift

Beyond meeting material needs, scholarship financing emerged as a critical psychological catalyst for many STEM doctoral students, instilling a heightened sense of purpose, validation, and motivation. The data revealed that receiving a scholarship was often interpreted as a vote of confidence in the student's potential, reinforcing their academic identity and deepening their commitment to persevere through the challenges of doctoral study. Several participants described how the award of a scholarship provided not only financial relief but also emotional and motivational uplift.

Participant R reflected:

"Getting the scholarship was a turning point. It made me feel seen. Like someone believed in me, and that I belonged in this field. It changed how I saw myself as a researcher."(Participant R, 6th March, 2026).

This sense of recognition, implicit in the scholarship award, counteracts self-doubt, imposter syndrome, and other psychological barriers that are common among doctoral students, especially those from underrepresented or disadvantaged backgrounds. For many, the scholarship served as more than just funding; it was a legitimizing force that confirmed their place in the academy. Participants also reported that the prestige associated with certain scholarships heightened their intrinsic motivation to perform. *Participant J* noted:

"There's a kind of pride that comes with being a scholarship recipient. It pushes you to work harder because you don't want to let the funders or your mentors down."(Participant J, 7th March, 2026).

Such statements point to a reciprocal sense of responsibility, where financial support was met with increased academic dedication. The expectation to uphold the reputation of the funding body, maintain strong academic performance, or fulfill reporting requirements contributed to a self-imposed standard of excellence. This internalization of accountability often led students to become more focused and disciplined in their research work. The role of scholarships in shaping students' academic identities was also emphasized by *Key Informant 1*:

"You see a change in posture, students walk differently when they know they've been selected for something competitive. It reinforces their sense of purpose and encourages long-term thinking about their academic careers."(Key Informant 1, 7th March, 2026).

This observation underscores how motivational uplift extends beyond the individual to become visible within the academic environment. The psychological confidence gained from scholarship recognition often translates into greater class participation, initiative in research, and willingness to engage in conferences or publish work. Furthermore, several participants indicated that scholarships enabled them to set higher academic goals. Without the distractions of financial hardship, they could focus more sharply on research excellence. *Participant T* shared:

"Before I got the fellowship, I was just trying to survive, pay rent, buy food, and stay enrolled. Once that was sorted, I started thinking about publishing, doing meaningful work and contributing to my field."(Participant T, 9th March, 2026).

In this context, the motivational uplift associated with scholarship financing not only preserved student morale but actively elevated it. This shift in perspective, from basic academic survival to scholarly ambition, was a recurring motif among scholarship recipients. Interestingly, motivational uplift was not solely confined to individual drive; some students also reported a desire to give back to their institutions or broader communities. The sense of being invested in by others instilled a moral obligation to make the most of the opportunity. *Participant L* stated:

"I feel I owe it to my sponsors and even future students to make this scholarship count. I want to make sure others see that their support wasn't wasted."(Participant L, 9th March, 2026).

These remarks highlight how scholarship financing can cultivate a sense of collective responsibility and academic citizenship. It motivates recipients not only to succeed personally but also to serve as examples or mentors for peers. Overall, the findings suggest that scholarships are powerful motivational tools that reinforce self-worth, elevate aspirations, and trigger transformative shifts in how students approach their doctoral journeys. The motivational uplift tied to scholarship financing thus plays a crucial, though sometimes overlooked, role in enhancing doctoral participation and performance, a conclusion supported by studies like Graddy-Reed et al. (2021), Nguyen et al. (2019), and Belavy et al. (2020), all of which highlight how scholarships positively impact completion rates, research productivity, and overall academic success by enabling students to focus more intently on their studies.

4.4.4 Competitive Pressures

Scholarship financing, while broadly beneficial, also introduced elements of heightened competition that shaped students' experiences in STEM doctoral programmes. The data revealed that the selective and performance-based nature of many scholarship schemes created an atmosphere of pressure and comparative anxiety among recipients and non-recipients alike. Far from being a neutral mechanism of support, scholarships often set in motion

competitive dynamics that influenced students' academic behaviour, self-perception, and peer interactions. Several participants articulated that the pursuit of scholarships fostered a sense of academic rivalry, particularly in contexts where funding was limited, and renewal depended on performance. *Participant F* shared:

"You're constantly aware that others are trying to get the same scholarship or renew it. It's not just about doing your research well, it's about outperforming others. That creates tension, even among friends." ((Participant F, 9th March, 2026).

This observation captures the dual-edged nature of scholarships as both incentives and stressors. While they can inspire academic excellence, they may also cultivate environments of hyper-competitiveness, where collaboration is sometimes sacrificed in favor of individual advancement. The perception that scholarships are scarce and merit-based encouraged some students to see peers more as rivals than as allies. Moreover, recipients often reported internalizing high expectations linked to scholarship receipt. Rather than experiencing scholarships as unconditional support, many felt an implicit demand to prove their worth continuously. *Participant N* noted:

"There's this silent pressure, like now that you've been funded, you can't afford to slip. If your grades fall or your research stalls, you fear it will be taken away or that people will say you didn't deserve it." ((Participant N, 9th March, 2026).

Institutional expectations and reporting requirements compounded this psychological burden. For some, the scholarship became less a reward and more a source of anxiety. Rather than freeing them entirely from stress, financial support sometimes transferred the locus of pressure, from financial instability to performance monitoring. From the perspective of institutional stakeholders, this competitive dynamic was viewed as a structural consequence of resource scarcity. *Key Informant 5*, a senior administrator in graduate education, explained:

"We don't have enough scholarships for everyone, so naturally, there's a selection effect. And when resources are tied to academic metrics, students adapt by becoming more strategic and competitive. That's not always a bad thing, but it does change the culture." ((Key Informant 5, 10th March, 2026)

This recognition points to the systemic underpinnings of competition. While the institution may intend to reward excellence, the outcome is a stratified environment where participation is shaped not only by capability but also by funding status. Students who secure scholarships gain access to additional opportunities, such as conference travel or research collaborations, further widening the gap between funded and non-funded peers. Notably, non-recipients also experienced the ripple effects of this competitive climate. Several students reported feelings of inferiority, marginalization, or demoralization when observing peers who had secured prestigious funding. *Participant K*, who had applied unsuccessfully for three different fellowships, commented:

"Sometimes you feel like you're not good enough. Everyone around you has some scholarship or another, and it affects your confidence. You start questioning your place in the programme." ((Participant K, 10th March, 2026)

This sense of exclusion highlights that scholarships can inadvertently reinforce hierarchies within doctoral cohorts. While they aim to level the playing field financially, they may also signal merit in ways that shape student self-concepts and peer dynamics. This unintended consequence suggests a need for institutions to carefully manage the narratives and support structures surrounding scholarships to prevent morale-related disparities. Nonetheless, it is important to acknowledge that for some students, the competitive pressures associated with scholarship financing served as positive motivators. The awareness that continued support was contingent on academic progress instilled a sense of urgency and focus. *Participant Q* described it as follows:

"Knowing that I had to meet certain milestones to keep my funding kept me on track. I didn't have the luxury of procrastination. It was stressful, yes, but it also kept me accountable." ((Participant Q, 10th March, 2026)

This comment illustrates the delicate balance between constructive motivation and unhealthy stress. For motivated students with strong coping mechanisms, scholarship-related pressures can sharpen academic engagement. For others, particularly those already grappling with imposter syndrome or personal stressors, the same pressures can become overwhelming.

In sum, the findings suggest that scholarship financing introduces complex competitive dynamics within STEM doctoral education. While these may drive academic performance in some cases, they also risk creating psychological strain and social fragmentation. From a policy standpoint, institutions might consider how scholarship programmes can support excellence without unintentionally fostering exclusionary cultures. Transparent communication, holistic selection criteria, and robust academic counseling help mitigate the more detrimental aspects of these competitive pressures, ensuring that scholarships remain a force for inclusion rather than division.

4.5 Integrated Interpretation of Quantitative and Qualitative Findings

The integration of quantitative and qualitative findings reveals both convergence and divergence in how scholarship financing influences participation in STEM doctoral programmes. The quantitative data showed a statistically significant difference in participation scores, with students who received at least one form of scholarship

reporting higher levels of engagement compared to those who did not. This pattern signals that financial support through scholarships is associated with stronger participation outcomes, a finding consistent with broader literature on the positive impact of grant aid on student persistence and degree attainment (Nguyen et al., 2019). This finding converges with several themes from the qualitative analysis. For instance, under the theme Entry into Doctoral Study, participants consistently emphasized that scholarships were instrumental in enabling their enrollment. Without such financial assistance, many indicated they would not have begun their doctoral studies, aligning with studies that show unfunded students have higher dropout rates (Wollast et al., 2018) and that scholarship cuts reduce overall participation (Rossello, 2023).

Similarly, the theme Enhanced Academic Focus aligns with the observed higher participation scores, as scholarship recipients described being able to dedicate more time and mental energy to academic work without the distractions of financial pressure, thereby enabling more consistent research output and higher quality work (Belavy et al., 2020; Graddy-Reed et al., 2021). The theme Motivational Uplift also reinforces the quantitative trend. Students who received scholarships described feeling affirmed, supported, and motivated to excel, which corresponds to their higher participation ratings. Their narratives revealed a psychological benefit of scholarships, in addition to the material support, which may contribute to the stronger engagement measured in the quantitative findings. However, divergence emerged in the theme Competitive Pressures. While the statistical analysis showed an overall positive association between scholarships and participation, qualitative accounts suggested that the scholarship environment could also introduce performance anxiety and create a culture of comparison. This complexity is not captured in the participation score alone, highlighting that financial support, while beneficial, may come with unintended emotional consequences, a nuanced aspect that aggregate statistical analyses might overlook, as seen in some studies focusing on efficiency over holistic student well-being (Rossello, 2023).

Taken together, the findings support a clear argument: scholarships increase participation primarily by stabilizing doctoral trajectories. Quantitative results suggest higher participation among scholarship recipients, and qualitative evidence explains why: scholarships enable entry, protect time for research, expand access to scholarly opportunities, and reinforce academic identity. These mechanisms make scholarship funding more than a welfare tool; it is a participation infrastructure that conditions how students allocate time, sustain momentum, and integrate into research communities (Belavy et al., 2020; Graddy-Reed et al., 2021; Nguyen et al., 2019). At the same time, the qualitative findings show that scholarship effects are not uniform. Full scholarships produce continuity and academic immersion, while partial awards may still leave students exposed to financial interruptions that weaken focus and delay progress. Competitive pressures further show that scholarships can introduce performance anxiety and social stratification within cohorts, dynamics that are not captured by mean differences alone (Rossello, 2023). The integrated conclusion is therefore not simply that scholarships improve participation, but that they improve participation by reducing financial volatility, and that the magnitude and quality of that improvement depend on scholarship adequacy and the academic culture surrounding funded status.

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

This study examined the influence of scholarship funding on the participation of students in STEM doctoral programmes in selected universities in Kenya. The findings demonstrate that scholarship funding is a critical determinant of doctoral participation, progression, and completion within STEM fields. Financial support significantly reduces the economic barriers that often prevent qualified students from enrolling in or completing doctoral studies. In contexts where doctoral education requires substantial time commitment and financial resources, the availability of scholarships enables students to dedicate adequate time to research and academic engagement.

The findings indicate that students who receive consistent and adequate funding are more likely to enrol in doctoral programmes, remain engaged throughout the programme, and complete their studies within the expected timeframe. Scholarship funding supports tuition costs, research expenses, and living costs, which collectively reduce financial stress among doctoral candidates. As a result, funded students are better able to focus on research productivity and academic development. These findings are consistent with previous research showing that financial aid positively influences graduate student persistence and degree attainment, as demonstrated by Thi Diep Nguyen, Jenna W. Kramer, and Benjamin J. Evans.

The results also highlight that insufficient or irregular scholarship funding can discourage prospective students from pursuing doctoral education, particularly in resource-intensive STEM disciplines. Many potential candidates delay or abandon doctoral aspirations due to financial constraints. This pattern reflects broader trends observed in higher education systems where funding availability strongly shapes access to doctoral training, as discussed by Nico Cloete and colleagues in their analysis of research universities in Africa. Overall, the study confirms that scholarship funding plays a central role in expanding doctoral participation in STEM fields. Adequate and sustainable funding mechanisms are essential for strengthening doctoral education and increasing the production of highly skilled

researchers. Given the importance of STEM research in national innovation and development, investment in doctoral scholarships remains a strategic priority for universities and governments seeking to enhance research capacity and knowledge production.

5.2 Recommendations

Based on the findings of the study, several recommendations can be proposed to improve participation in STEM doctoral programmes in Kenyan universities. First, the Government of Kenya and higher education policymakers should establish a national STEM doctoral scholarship fund dedicated to supporting doctoral training in science, technology, engineering, and mathematics fields. Such a fund could be initiated through government seed funding and complemented by contributions from international development partners, research foundations, and private sector organizations. A coordinated national funding mechanism would help expand access to doctoral education and ensure sustainable financial support for students pursuing advanced research training. Second, universities should diversify institutional funding mechanisms for doctoral students by developing structured doctoral funding models. These may include research assistantships, industry-sponsored doctoral fellowships, and collaborative research grants linked to national development priorities. Similar models have been successfully implemented in several African research universities where doctoral students are integrated into funded research projects, enabling them to receive stipends while contributing to ongoing research initiatives. Third, scholarship programmes should provide comprehensive funding packages that cover tuition fees, research costs, and basic living expenses throughout the doctoral study period. The findings of this study indicate that partial scholarships may still leave students financially vulnerable, forcing them to seek external employment that may interfere with their research progress. Policymakers should therefore consider adopting differentiated funding strategies where full scholarships are prioritized for research-intensive STEM programmes, while partial scholarships may be supplemented through research assistantships or institutional grants. Finally, universities should strengthen information dissemination and transparency regarding scholarship opportunities. Establishing centralized digital platforms or graduate funding offices that regularly publish available scholarships, eligibility criteria, and application timelines can improve students' access to funding information. Improved communication mechanisms would ensure that qualified candidates are aware of available opportunities and can prepare competitive applications. Implementing these measures would help reduce financial barriers to doctoral education, strengthen research capacity, and increase participation in STEM doctoral programmes within Kenyan universities.

Declaration of Interest

The authors declare that they do not have any known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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