

Predictors of Library and Information Science Students' Achievement in Research Statistics: A Path Model from the University of Abuja, Nigeria

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Abstract: *This study examined the path model of variables affecting Library and Information Science (LIS) students' achievement in research statistics, with empirical evidence from the University of Abuja, Federal Capital Territory, Nigeria. Two objectives guided the study: to develop a meaningful path model of variables affecting students' achievement in research statistics and to determine the estimates of the causal links among lecturers-related, students-related and school-environment-related variables. The study adopted an ex-post-facto and cross-sectional survey approach. The participants comprised 49 LIS students and eight lecturers teaching research statistics at the University of Abuja. Data were obtained through the lecturers-related and students-related variable questionnaires and students' achievement records. Path analysis was used to examine the structural relationships. The results showed that students-related variables constituted the strongest component of the meaningful path model, with a reported regression weight of 0.41. The estimated path coefficients for lecturers-related, students-related and school-environment-related variables were 0.21, 0.41 and 0.31, respectively, indicating an interconnected relationship among the three clusters. The study concludes that improvement in research statistics achievement requires simultaneous attention to students' motivation, self-efficacy, anxiety, prior quantitative preparation and study behaviours, alongside teaching quality and institutional learning conditions.*

Keywords: library and information science, research statistics, academic achievement, path analysis, students-related variables, lecturers-related variables, school environment, University of Abuja

INTRODUCTION

Education is a broad term that is used to define the process of transmitting and gaining knowledge in a structured environment and the acquisition of skills, values and ethics. It

functions as a transformative force that enhances health outcomes, livelihoods, and social cohesion. Education is segmented into different levels of with higher education as one. Higher education institutions are central to the development of skilled human capital capable of addressing real societal challenges, widely recognized as a critical driver of human capital development. One of the fields in higher education is the library and information science. Library and Information Science (LIS) has evolved from a traditional pathway librarianship into a strategic programme that equips professionals for the demands of contemporary knowledge societies (Adeagbo and Mabawonku, 2022)

Library and information science (LIS) as a programme provides the conceptual and practical foundation for training professionals who manage information resources and support research and community engagement globally (including Africa). The objectives of teaching LIS at the Nigerian universities include; developing theoretical understanding of information phenomena, practical skills in cataloguing, classification and reference services, information communication and technology (ICT) competencies, and research capacities. To help Library and information science students develop research capacities, the course, Research statistics, is a core component of their curriculum. It equips library and information science students with the analytical skills to collect, analyse, and interpret quantitative and qualitative data about information resources, users, and services. Engagement of library and information science students in research-related activities, including quantitative data analysis is significantly associated with higher academic performance, which reinforces the centrality of research statistics to effective library and information science programme (Opele et al., 2025)

Result analysis in research statistics from the universities in North-Central zone in Nigeria showed that in 2020/2021 academic session, the percentage passed was 61.03%, 2022/2023 70.13% and 2023/2024 the percentage was 78.06%. this points to the fact that Library and information science students' achievement in research statistics is shaped by an interconnected web of variables operating at multiple levels (Chaudhary & Singh, 2022). This inconsistency calls for the need for this study, aimed at improving students' achievement in the course because understanding the persistent underachievement of students in research statistics requires careful attention to the specific factors that drive achievement in the course. Among these factors, the lecturers-related variables, students-related variables and school-environment related variables stand out as key and substantial contributors,

Lecturers-related variable refers to any characteristic, behaviour or professional attribute of the teaching staff that directly influences the quality of instruction delivered which leads to the academic achievement of students in a given course (Klassen & Chiu, 2020). It includes teaching method, lecturer qualification, attitude to teaching, lecturer-student interaction, and commitment to teaching. This variable emphasizes that instructional method can determine whether students remain passive recipients of statistical information or become actively involved in problem solving and application. Lecturer commitment and interaction are equally important because statistics learning requires opportunities for explanation, clarification, practice and timely feedback (Chaudhary & Singh, 2022; Aguilon & Guhao, 2024).

Students-related variables refer to the internal dispositions, competencies, and behavioural patterns that learners bring to the academic process, and they are among the most proximal determinants of achievement. Variables such as academic motivation, statistics self-efficacy,

statistics anxiety, prior quantitative background in mathematics, study habits, peer interaction, interest in the subject, and socio-economic background collectively shape students' attitude, approach, and persistence in research statistics. These factors are particularly important in research statistics because students frequently enter the course with different levels of perspectives, mathematical preparation and different affective dispositions toward quantitative work (Aguilon & Guhao, 2024)

The school-environment related variables refer to the physical and social conditions within which students carry out their learning, the institutional conditions in which teaching and learning occur. It encompasses both the physical setting of the institution, including its buildings and facilities, as well as the broader culture and climate of the school, its policies and practices, and the interactions that take place among students and staff. A favourable school environment can have a considerable positive effect on students' achievement and overall well-being, whereas an unfavourable school environment can impede learning and give rise to negative outcomes such as absenteeism, behavioural difficulties, and poor academic performance (Adeagbo & Mabawonku, 2022). Among the specific elements of the school environment that can influence students' achievement in research statistics are instructional facilities, classroom availability, class size, curriculum design and implementation, and the lecture timetable.

Given the multiplicity and interdependence of these variables, a purely descriptive, correlational approach and randomized experiments to investigating library and information science students' achievement in research statistics is insufficient. Creswell and Creswell (2023) noted that correlational designs can identify the direction and strength of relationships but cannot determine causal direction or account for the influence of unmeasured confounding variables. A causal model, by contrast, specifies the directional structure of relationships from the outset, controls simultaneously for multiple influences, and produces path coefficients that estimate each variable's independent contribution to the outcome. Causal models are commonly used to describe casual relationships between a set of variables like teachers-related variables, students-related variables and school environment-related variables. Thus, this study posits that the simultaneous influence of these variable clusters makes a single-variable explanation inadequate. To give the Causal model its balance, the Theory of Parsimony is applied to provide a basis for selecting a concise set of theoretically meaningful variables, while the Theory of Connectivity/Connectivism emphasizes the interconnectedness of learners, lecturers, resources, institutions and learning environments (Spade, 1999; Siemens, 2005). Path analysis is consequently appropriate because it permits the estimation of directional relationships among multiple variables within one structural framework (Kline, 2023; Schumacker & Lomax, 2021).

Various LIS Departments have attempted interventions such as revising course outlines, organizing remedial sessions, and encouraging the use of open-source software, yet these efforts have only yielded marginal and inconsistent improvements because existing studies remain largely descriptive or correlational, creating a pressing need for a study that moves beyond listing factors to construct a coherent framework of exogenous and endogenous variables. Addressing this research gap is essential for providing decision-makers with the actionable insights required to focus resources on the most effective pedagogical training,

curriculum redesigns, and students' interventions. This study seeks to investigate the variables affecting students' achievement and develop a model, generating the context-specific causal evidence for university of Abuja that the immediate institution and other institutions, educators, and policymakers need to design interventions that will actually work.

Objectives of the Study

The specific objectives of this study are to develop a meaningful path model of variables affecting undergraduate library and information science students' achievement in research statistics and estimates of the causal links among lecturers-related, students-related and school-environment related variables affecting undergraduate library and information science students' achievement in research statistics in University of Abuja, Nigeria.

LITERATURE REVIEW

Lecturers-related variables refer to the instructional factors directly associated with the lecturer and the teaching process. These variables are consistently identified among the most powerful proximal determinants of student learning outcomes, accounting for a substantial portion of the explainable variance in student achievement in research statistics (Chaudhary & Singh, 2022). Students-related variables, as defined by Adie, Anditung, and Inah (2020), are factors associated with students at all educational levels that either promote or hinder their academic performance. They encompass the personal, psychological, motivational, cognitive, and behavioural characteristics that learners bring to the academic encounter, and they are among the most proximal determinants of achievement because they mediate how students receive, process, and respond to instructional and environmental influences (Havidz & Mujakiah, 2023). Adie, Anditung, and Inah (2020) further opined that Students' variables that determine academic achievement include motivation, attitude, interest, and learning habit.

School-environment related variables describe the institutional, physical, organizational, and contextual conditions within the university setting that frame the circumstances under which teaching and learning take place, constituting what educational researchers describe as the meso-level and macro-level determinants of student achievement (Havidz & Mujakiah, 2023). These variables operate above the level of the individual student yet exert significant and measurable influence on learning outcomes, both directly through the material conditions they create for statistical instruction and indirectly through their effects on student motivation, engagement, anxiety, and access to the learning resources that research statistics competence development requires (Chapagai, 2024).

The conceptual framework groups the explanatory variables into three clusters: lecturers-related variables, students-related variables and school-environment-related variables. The lecturers-related cluster covers teaching method, lecturer qualification, lecturer attitude to teaching, lecturer–student interaction and commitment to teaching. The students-related cluster covers academic motivation, self-efficacy, anxiety, prior background knowledge, attitude, study habits, peer interaction, interest and socio-economic background. The school-environment cluster covers instructional facilities, classroom availability, class size, curriculum design and implementation, and lecture timetable.

The three clusters are not treated as independent islands. The proposal conceptualizes the school environment as the institutional substrate within which teaching and learning occur, while student characteristics constitute the point at which instructional and environmental conditions are translated into engagement and achievement. This arrangement is consistent with Aina et al., (2024); Chaudhary & Singh, (2022); Cayubit, (2022) which indicates that teaching quality, student dispositions and institutional conditions jointly shape academic outcomes which was used to develop a hypothesized model of the relationship between these three variables below:

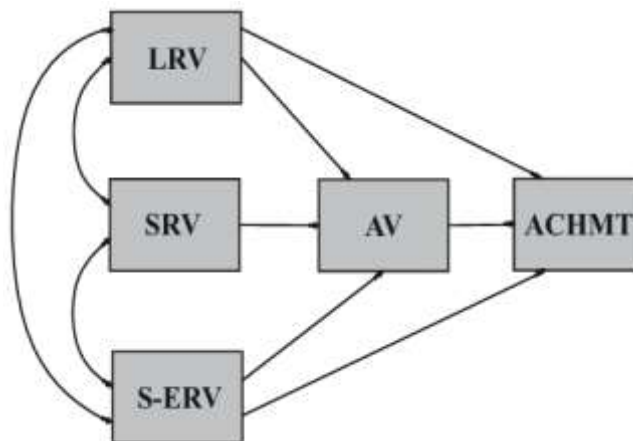


Figure 1. Hypothesized Conceptual representation of the relationships among lecturers-related variables (LRV), students-related variables (SRV), school-environment-related variables (S-ERV), achievement variables (AV) and academic achievement (ACHMT).

Source: Researchers, 2026

The Theory of Parsimony, rooted in Occam's Razor, holds that among competing explanations that adequately account for a phenomenon, the simpler explanation with fewer unnecessary assumptions should be preferred. In quantitative modelling, parsimony supports the selection of theoretically justified predictors without introducing unnecessary complexity. Within this study, the theory supports the effort to identify the most meaningful combination of lecturer, student and school-environment variables capable of explaining research statistics achievement without producing an unnecessarily complex model (Spade, 1999).

The Theory of Connectivity, represented in the study through Siemens' (2005) connectivist perspective, emphasizes that knowledge and learning are distributed across networks of people, information, technologies and environments. Applied to research statistics achievement, the theory suggests that students' outcomes emerge from connections among lecturers, learners, peers, learning resources and institutional conditions. Effective teaching may strengthen students' interest and confidence; a supportive environment may facilitate motivation and access to resources; and student dispositions may determine how effectively these opportunities are converted into achievement. The theory therefore provides a conceptual basis for examining direct and indirect relationships among the three variable clusters.

METHODOLOGY

The study adopted an ex-post-facto research design combined with a cross-sectional survey approach. The ex-post-facto component was appropriate because students' achievement in research statistics had already occurred and could not be manipulated by the researcher. The cross-sectional survey component permitted the collection of information on lecturer-related and student-related variables at a single point in time. The analytical logic followed the use of path analysis to examine the relationships among exogenous and endogenous variables.

The population of the study consists of 49 300 level library and information science students who are thought research statistics at that level from the Department Library and Information Science, Faculty of education and 8 lecturers teaching research statistics in university of Abuja.

The sample of study consisted of all the 49 library and information science students and eight lecturers teaching research statistics. The use of census method in selecting the sample was to have a large sample. This is because survey studies require large sample for the purpose of generalization. Two questionnaire instruments formed the principal survey measures: the Lecturers-Related Variable Questionnaire (LRVQ) and the Students-Related Variable Questionnaire (SRVQ). Students' research statistics achievement was obtained from students' records. Path analysis was used to estimate the relationships among the study variables. The procedure was selected because it permits simultaneous estimation of relationships among multiple variables and supports the decomposition of relationships into meaningful path coefficients.

RESULTS AND FINDINGS

Research Question 1:

What is the meaningful path model of variables affecting undergraduate library and information science students' achievement in research statistics in University of Abuja, Nigeria?

Figure 2 presents the causal path model with their coefficient estimates depicting the most meaningful path model of variables affecting undergraduate library and information science students' achievement.

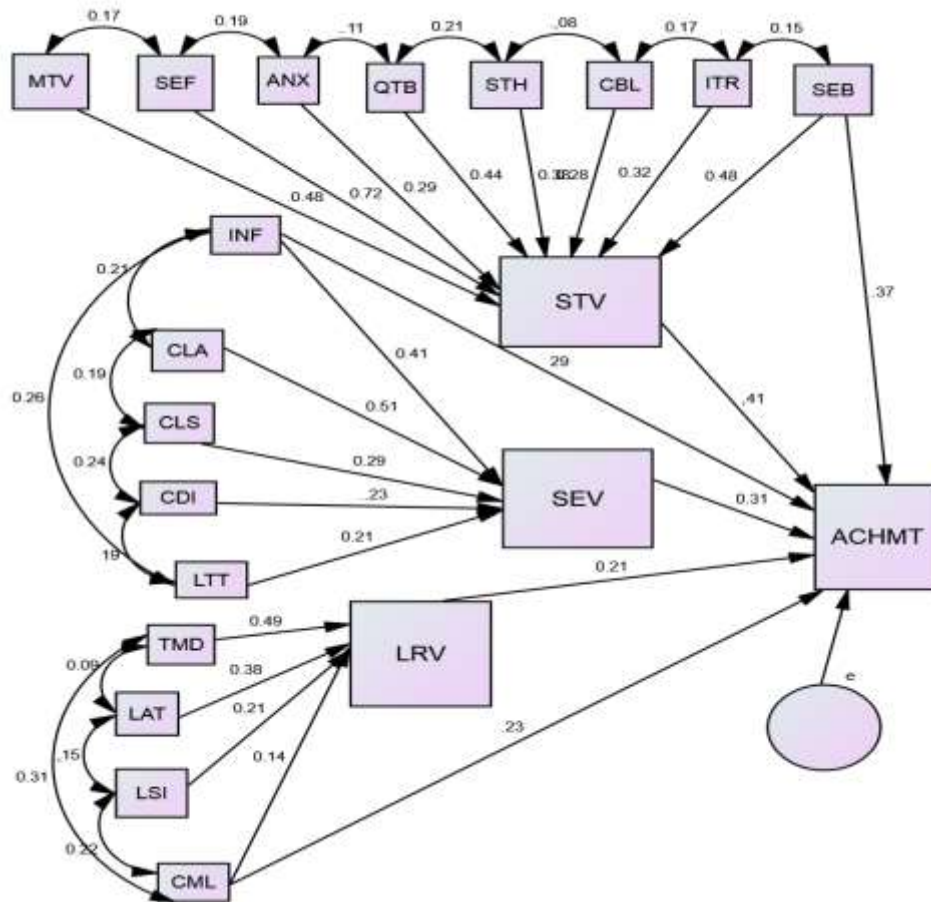


Figure 2: The meaningful path model of variables affecting library and information science students' achievement in research statistics.

The results of the analysis from figure 2 indicates that the meaningful path model is the student's related variables with a regression weight of 0.41. This implies that student related variable contributed 41% to students' achievement in research statistics. Hence students' factor is key to their achievement in research statistics

Research Question Two

What are the estimates of the causal links among lecturers-related, students-related and school-environment related variables affecting undergraduate library and information science students' achievement in research statistics in North-Central zone universities, Nigeria?

To answer the research question, path coefficient on causal link among lecturers-related, students related and school related coefficient was used and is presented in figure 3

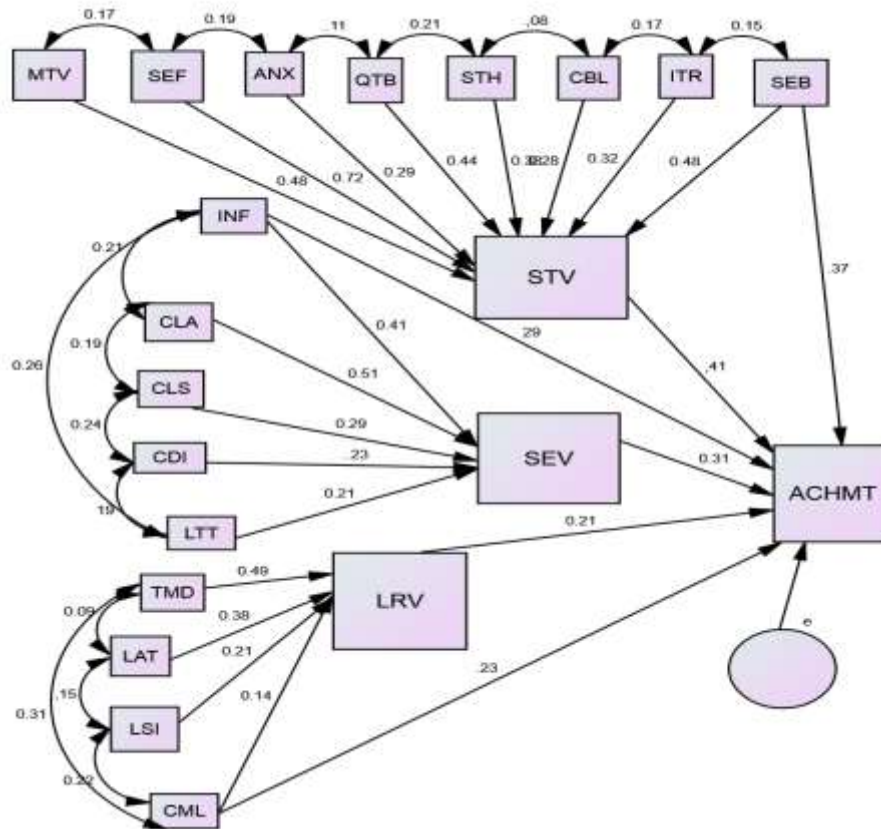


Figure 3: Results showing causal link among lecturers, students and school environment variables affecting student achievement in research statistics

Figure 3 shows the results of the analysis on the causal link between lecturer related variable, students related and school environment variables as 0.21, 0.41 and 0.31 respectively. This indicates that lecturers related variables, students' related variables and environmental related variables contributed 93% to library and information science students' achievement in research statistics.

DISCUSSION

The first objective sought to develop a meaningful path model of variables affecting undergraduate LIS students' achievement in research statistics. The analysis reported in the study identified the students-related variable cluster as the most meaningful component of the model, with a regression weight of 0.41. The result indicates that student-related conditions occupy a particularly important position in explaining research statistics achievement within the University of Abuja context. The model places student-related variables at a central position in the achievement structure. This result is consistent with the proposal's conceptual argument that students' motivation, self-efficacy, anxiety, prior background knowledge, attitude, study habits, peer interaction, interest and socio-economic background can determine how effectively students respond to instruction and available learning opportunities. The 0.41 regression weight therefore gives empirical support to the proposition that student-level characteristics are a

major component of research statistics achievement. The finding agrees with Aguilon and Guhao (2024), whose structural model linked teaching performance, student self-efficacy and academic success. Similarly, Madu and Obasi (2022); Ramirez et al. (2023) stated that statistics-related anxiety with cognitive and behavioural inhibition and identifies prior mathematical knowledge as a predictor of achievement in research methods and quantitative courses.

The implication is not that responsibility for achievement should be transferred to students alone. Rather, the result identifies student dispositions as a critical point of intervention. A student who lacks confidence, fears statistical procedures or approaches the course with little interest may not benefit fully from otherwise adequate instruction. Conversely, motivation, self-efficacy, effective study habits and constructive peer interaction can strengthen the learner's capacity to benefit from teaching and institutional resources. This interpretation is consistent with the Theory of Connectivity because the learner is a node within a broader learning network rather than an isolated unit. Thus, the result is not interpreted as meaning that student factors operate independently of lecturers or the institutional environment. The conceptual model and the subsequent causal-link estimates indicate that the three clusters are interconnected. The prominence of the student-related cluster is better understood as evidence that the learner is the immediate point at which instructional practices and environmental opportunities are translated into engagement, persistence and academic performance.

The second objective determined the estimates of the causal links among lecturers-related, students-related and school-environment-related variables. The reported path coefficients were 0.21 for lecturers-related variables, 0.41 for students-related variables and 0.31 for school-environment-related variables. The pattern places students-related variables first, followed by school-environment-related variables and lecturers-related variables.

Variable cluster	Reported path coefficient	Interpretation in the study
Lecturers-related variables	0.21	Positive contribution within the reported causal structure
Students-related variables	0.41	Strongest of the three reported coefficients
School-environment-related variables	0.31	Substantial contribution within the reported causal structure

The pattern of coefficients indicates that achievement in research statistics is embedded in a network of learner, teaching and institutional influences. The student-related coefficient of 0.41 was the largest, reinforcing the first objective's finding. The school-environment coefficient of 0.31 indicates that institutional conditions also have a substantial role, while the lecturer-related coefficient of 0.21 indicates a meaningful instructional component. The finding supports the central proposition of the study that a purely single-variable approach would be inadequate for understanding a complex academic outcome. The lecturer-related coefficient of 0.21 reinforces the importance of teaching quality. Research statistics requires explanation, demonstration, guided practice and feedback. Teaching methods that promote active learning can help students move from memorising statistical terminology to applying procedures to research problems.

Chaudhary and Singh (2022) reported consistent relationships between teaching-related factors and student learning outcomes, while Aguilon and Guhao (2024) demonstrated the importance of teaching performance and self-efficacy within a structural model.

The school-environment coefficient of 0.31 is also theoretically and empirically meaningful. The proposal identifies instructional facilities, classroom availability, class size, curriculum implementation and lecture timetable as relevant institutional conditions. Research statistics is particularly sensitive to the availability of computers, statistical software, internet access and opportunities for practical demonstration. Nwosu and Igwe (2023) identified ICT competence and institutional conditions as relevant to LIS students' academic achievement, while Ezeala and Yusuff (2021) documented resource inadequacies in Nigerian university libraries that can constrain academic work.

The three coefficients together reinforce the Theory of Connectivity. Achievement emerges through connections among teaching practices, student dispositions and the learning environment. A supportive environment may make practical learning possible; effective instruction may strengthen student confidence; and motivated students may make better use of available institutional resources. The causal structure therefore provides a more useful explanatory perspective than treating lecturer quality, student characteristics and school conditions as unrelated predictors.

The finding also supports the Theory of Parsimony. The study identified numerous individual variables, the empirical model organizes them into three theoretically meaningful clusters. This provides an interpretable structure for explaining achievement without reducing the phenomenon to a single predictor. The value of the model lies precisely in its ability to represent the central relationships while retaining a manageable analytical structure. This study presents the numerical coefficients as reported estimates rather than reinterpreted as percentages because path coefficients and explained variance are conceptually distinct statistical quantities. The substantive conclusion nevertheless remains clear: the three clusters jointly constitute an important explanatory structure for research statistics achievement.

Implications for LIS Education/Recommendation

Based on the figure 4 bellow, the findings have the following implications and recommendations for LIS curriculum delivery at the University of Abuja and comparable university contexts:

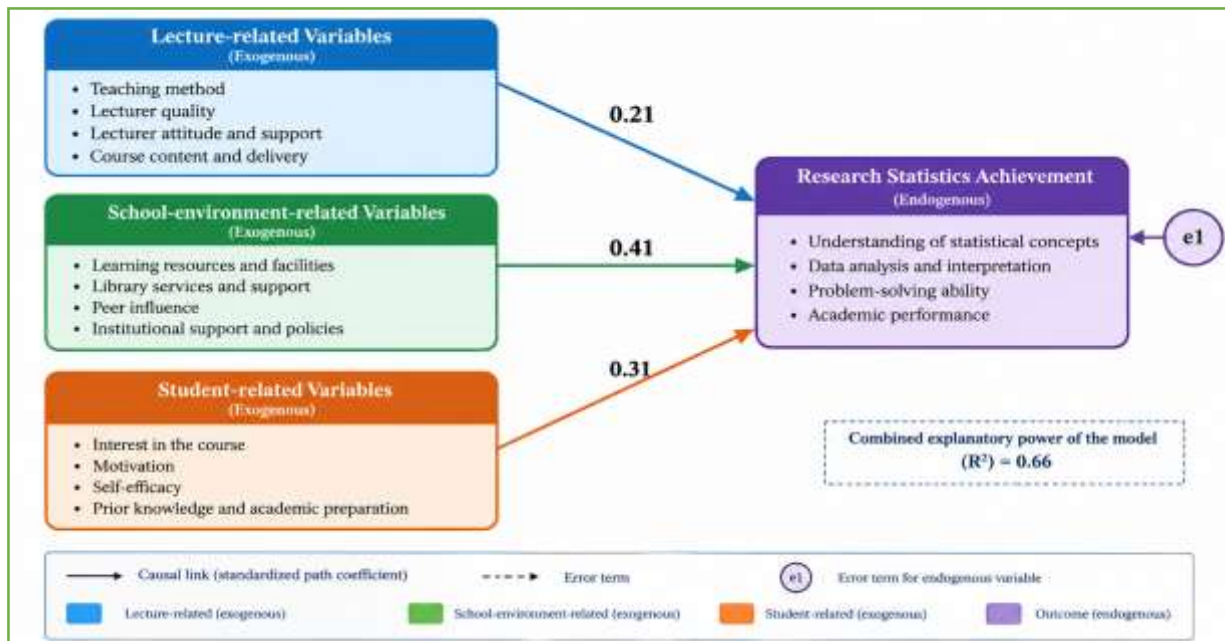


Figure 4: Combined explanatory power of the causal/path model of variables affecting LIS students in University of Abuja, Nigeria, 2026.

Research statistics should be treated as a competency requiring sustained development rather than as a narrowly bounded course that students encounter only at the point of assessment. The study observed that quantitative content is often introduced relatively late in the LIS curriculum and that students may have limited sustained exposure to statistical reasoning before the 300 level. Earlier exposure to basic quantitative reasoning and progressive practical exercises could help reduce the abruptness of the transition into research statistics. Therefore, LIS curriculum planners should consider progressive exposure to quantitative reasoning before the 300 level so that students enter research statistics with stronger foundational preparation

Lecturer development should include pedagogical approaches suited to statistics learning. Staff development should emphasize active learning, practical demonstration, problem-based activities and feedback. Where possible, students should see statistical procedures being performed and interpreted using real or realistic research data rather than encountering formulae without application.

LIS Departments/Units should strengthen student-focused support for research statistics by promoting academic motivation, statistics self-efficacy, constructive study habits and peer-supported learning. They should identify students experiencing persistent statistics anxiety or weak quantitative confidence early and provide structured academic support, mentoring and additional guided practice

Institutional support should ensure access to instructional facilities and information resources. A statistics course delivered without adequate computing facilities, statistical software, connectivity and relevant research resources limits the opportunities available to students to develop operational competence. The school-environment coefficient of 0.31 indicates that

institutional conditions deserve attention alongside student and lecturer factors. Institutional interventions should be coordinated rather than implemented in isolation because the results indicate that lecturer, student and school-environment factors operate within an interconnected achievement structure

Interventions should recognize the affective dimension of statistics learning. Motivation, self-efficacy and anxiety are not peripheral issues. Orientation, peer-supported learning, guided practice and early identification of students who struggle with quantitative concepts can complement improvements in instruction and infrastructure.

CONCLUSION

The study demonstrates that achievement in research statistics among LIS students at the University of Abuja is best understood through an interconnected model involving lecturers-related, students-related and school-environment-related variables. The meaningful path model identified students-related variables as the strongest component, with a reported regression weight of 0.41. The estimated causal-link coefficients of 0.21 for lecturers-related variables, 0.41 for students-related variables and 0.31 for school-environment-related variables further show that achievement is not adequately explained by a single category of influence. The findings give empirical support to the theoretical position of the study. Parsimony is reflected in the organization of numerous possible determinants into three meaningful clusters, while Connectivity is reflected in the interdependence of learner, lecturer and institutional influences. The results therefore support a coordinated approach to improving research statistics achievement rather than interventions directed exclusively at students, lecturers or institutional facilities.

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