



EXPLORING THE UTILIZATION OF LIBRARIES FOR MATHEMATICS STUDY AMONG ORDINARY PUBLIC SECONDARY STUDENTS

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ABSTRACT

The researcher examined the experiences and perspectives of ordinary public secondary students from two selected schools in Rwanda regarding their use of libraries for mathematics study. Utilizing a qualitative approach, data was gathered through in-depth interviews, focus group discussions, and observations to gather rich data from 50 students aged 15-18. Thematic analysis was employed to extract and analyse the participants' narratives. The findings revealed multifaceted insights into the students' engagement with libraries for mathematics learning. Students' motivations, challenges, and library use patterns are explored, shedding light on the factors influencing their choices. Furthermore, the study investigated the role of libraries in supporting mathematics education, including the availability of relevant resources, the accessibility of facilities, and the role of librarians in assisting students. It also highlighted the need for a concentrated effort to improve the accessibility and relevance of library resources for secondary students, particularly in the context of mathematics education. They ultimately contributed to improving mathematics education in Rwanda's secondary schools.

Keywords: Library Utilization, Mathematics Education, Qualitative Study, Mathematics and Secondary Students.

Introduction

Education is the cornerstone of a nation's progress, and mathematics, often referred to as the language of science, plays a pivotal role in shaping the intellectual landscape of a country (Barton, 2007). It is widely acknowledged that a strong foundation in mathematics is essential for individual success and a nation's economic development (Hanushek & Woessmann, 2023). However, in many developing countries like Rwanda, providing quality mathematics education to secondary students faces numerous challenges, including mathematics competitions, adequate teaching resources, ongoing teacher training, utilization of computational tools, supplementary classes, increased practice opportunities, and collaborative efforts among teachers, parents, and school administrators (Iyamuremye et al., 2022).

In light of the limited literature on library utilisation for mathematics study among ordinary public secondary students in Rwanda, this research addressed a significant gap in understanding the efficacy of library resources in enhancing mathematical proficiency among this demographic. This study was essential for teachers, policymakers, and stakeholders in Rwanda's educational system, providing valuable insights into the potential of

libraries as supportive environments for mathematics learning among ordinary public secondary students. By clarifying the impact of library utilisation on mathematics study, the research results aimed to inform evidence-based strategies for optimising resources and interventions, ultimately raising improved academic outcomes and enhancing educational equity for students in Rwanda.

Rwanda, a country with a rapidly growing economy and aspirations for technological advancement, recognises the importance of mathematics education in achieving its goals (Busaka, Kitta, & Umugiraneza, 2021). Despite these efforts, mathematics remains a subject that presents difficulties for many students, hindering their academic progress and limiting their prospects (Sibomana et al., 2021). One critical factor that can contribute to enhancing mathematics education is library availability and utilisation.

Libraries are not merely repositories of books; they are dynamic learning spaces that offer valuable resources, guidance, and support for students in their academic pursuits (Ajani et al., 2024). In the context of secondary education, libraries serve as vital hubs for students to access mathematics textbooks, reference materials, and other resources



that can supplement their classroom learning (Soulen & Tedrow, 2022). This qualitative study explored the utilisation of libraries for mathematics study among ordinary public secondary students in Rwanda, focusing on two selected schools by delving into the experiences, perceptions, and challenges these students face.

This study's findings were expected to benefit the selected schools and contribute to the broader discourse on enhancing mathematics education in Rwanda. Ultimately, the goal was to promote a culture of learning, curiosity, and excellence in mathematics among secondary students, thereby helping them unlock their full academic potential and prepare for a future in a rapidly evolving global landscape.

In recent years, the role of libraries in education has evolved significantly. Libraries are no longer just repositories of books; they have become dynamic spaces that support various aspects of learning and academic achievement (Smith, 2020). The review synthesised existing research to shed light on the importance of libraries in enhancing mathematics education and identify potential gaps in the literature. According to Beagle (2000), his research discussed the various resources and services offered by libraries that can

enhance mathematics learning. This included textbook access, online databases, digital resources, and librarian assistance. Libraries have long been recognised as essential components of the educational enhancement (Martzoukou, 2021).

Libraries serve as repositories of knowledge, offering a wide array of resources such as textbooks, reference materials, journals, and digital content (Abumandour, 2020). Libraries, particularly in public secondary schools, serve as a bridge between students and the vast world of information, providing a quiet and conducive environment for study (Asif & Yang, 2021). Furthermore, libraries support students in developing research skills and raising independent learning habits (Beagle, 2000). Studies have investigated the availability and accessibility of mathematics libraries in public secondary schools (Khan et al., 2022; Tsang & Chiu, 2022); their studies indicated that factors such as the number of books, quality of resources, and ease of access have been explored to assess the adequacy of library services in supporting mathematics learning. Researchers have also proposed and evaluated strategies to encourage students to use mathematics libraries more effectively (Khan et al., 2022); these strategies may include library

orientation programs, resource diversification, and integrating library resources into the mathematics curriculum.

With the advancement of technology, Khan et al. (2022) have explored the impact of digital resources and online platforms in mathematics education and have examined how e-books, online databases, and educational websites complement traditional library resources. Libraries serve as spaces for peer collaboration and group study, where students discuss mathematical problems, share insights, and help each other comprehend difficult topics (Vaishali & Rajan, 2022). Libraries provide a quiet and focused environment conducive to concentrated study, often essential for mastering mathematical concepts that require deep concentration (Mbarute & Ntiyuguruzwa, 2023).

The literature reviewed highlighted the pivotal role of libraries in supporting mathematics education among ordinary public secondary students. While there were notable benefits to library utilisation, various challenges and gaps exist in the current body of research. Understanding the dynamics between students, libraries, and mathematics study was crucial for designing effective interventions and policies to enhance mathematics education outcomes in Rwanda. As such, this

qualitative study aimed to contribute to this evolving field by exploring the experiences and perspectives of students in ordinary public secondary schools regarding their utilisation of libraries for mathematics study.

Methods

Research Approach

A well-structured research approach is essential in pursuing a deeper understanding of the utilisation of libraries for mathematics study among ordinary public secondary students in Rwanda. Within the context of two selected schools in Rwanda, the present research employed a qualitative approach to gather in-depth information about the utilisation of libraries for mathematics study among secondary students. Qualitative research was chosen for its ability to capture rich and contextual data, allowing for a deeper understanding of the subject matter.

Research Setting

In the pursuit of educational excellence, the role of libraries as invaluable learning spaces cannot be overstated. This setting was characterised by its unique blend of historical, cultural, and educational factors, which shape the landscape of library usage among secondary students. These schools serve as microcosms of the larger educational system and offer a unique vantage point to



investigate the dynamics of library usage for mathematics study. The present research was conducted in two selected ordinary public secondary schools, which were purposively selected based on their accessibility and willingness to participate in this study. These schools were located within the Gasabo District in Rwanda.

Participants

Acknowledging the nuances of participants' experiences and viewpoints is paramount in educational research. The current study engaged with 50 secondary students aged 15 to 18 from two specific schools (referred to as S01-50). This diverse cohort encompassed students of varying ages, genders, academic capabilities, and mathematical aptitudes. This broad range of participants was intentionally selected to facilitate a thorough examination of library usage patterns and strategies, ensuring a comprehensive and inclusive analysis.

Data Collection

In the present study, semi-structured interviews were conducted with students to gather their perceptions, experiences, and challenges related to using the library for mathematics study. A set of open-ended questions guided the interviews. Also, focus group discussions were organised with small students to encourage peer interactions and explore

shared experiences regarding library utilisation for a mathematics study. Additionally, I spent time in the libraries of the selected schools to observe how students use library resources, spaces, and facilities for mathematics study.

Data Analysis

Through rigorous data collection methods such as interviews, focus group discussions, and observations, we have accumulated a wealth of qualitative data that captures the perspectives, experiences, and behaviours of ordinary public secondary students in Rwanda regarding library utilisation for a mathematics study. In the present study, interview transcripts and observation notes were coded using thematic coding techniques to identify recurring themes and patterns related to library utilisation for mathematics study. Themes were developed based on coded data to organise and interpret findings. The collected data were interpreted to generate insights and conclusions related to students' utilisation of libraries for mathematics study.

Ethical Considerations

In the present study, informed consent was obtained from all participants, and they were informed about the purpose of the study, their rights, and the confidentiality of their responses. Participants' identities were kept

confidential, and pseudonyms were used to report findings. Also, ethical approval was sought from the relevant ethical review before conducting the study.

Validity and Reliability

In the present study, methods such as member checking, peer debriefing, and triangulation were employed to ensure the trustworthiness of the research findings. These techniques have enhanced the validity and reliability of this study.

Limitations

It was essential to recognise that this study provided valuable insights into the utilisation of libraries for mathematics study among ordinary public secondary students in Rwanda. The findings of this qualitative study were not generalisable to all public secondary schools and students, as it focused on a specific geographic area and a limited number of schools.

Results

Through thematic analysis, it was noted that most students allocated minimal time in the library, predominantly utilising it as a quiet environment for studying or completing assignments unrelated to mathematics, as revealed during interviews.

Theme 1. Utilisation of Library Space

The observations during library visits revealed a trend among students to use the library primarily for quiet study or

completing assignments unrelated to mathematics. This suggested that the library serves as a preserve for general academic pursuits rather than a specific hub for mathematical studies. Despite resources, students seem to gravitate towards other areas for mathematics-related work, perhaps due to a lack of awareness or perceived inadequacy of the library's offerings in this subject. As one highlighted,

I am trying to focus on my history essay instead of mathematics (S14)

Theme 2. Peer Influence on Study Habits

The influence of peers on students' library usage patterns is evident, as observed by the researcher. Students tend to mirror the behaviour of their friends, and if the majority do not utilise the library for mathematics study, others are less inclined to do so as well. This social dynamic underscores the importance of peer influence in shaping academic habits and preferences, even in the choice of study environment.

Theme 3. Resource Awareness and Accessibility

A significant finding from the interviews is the widespread lack of awareness among students regarding the mathematics resources available in the library. Despite the presence of textbooks, reference



materials, and digital resources, many students remain oblivious to these offerings. This points to a crucial gap in the communication or promotion of library resources, hindering students from fully utilising the available tools for their mathematical studies. As one pickled,

I am unaware of the math resources stocked in the library (S07).

Theme 4. Perceived Barriers to Library Usage

Students face various perceived barriers that discourage them from using the library for mathematics study. Issues like limited library hours, uncomfortable seating, and inadequate lighting create a less conducive learning environment. Though seemingly trivial, these barriers collectively impact students' decisions regarding where to study mathematics, with convenience often outweighing the potential benefits of utilizing library resources. One indicated,

Yeah, it is frustrating. I want to utilize the library for math, but its limited hours make it difficult to concentrate and learn effectively (S03).

Theme 5. Misconceptions About Library Purpose

The interviews highlight misconceptions among students regarding

the primary purpose of the library. Many view it solely as a place for borrowing books rather than a multifunctional space for studying and research. This narrow perception limits students' exploration of the library's offerings and its potential as a resource-rich environment conducive to academic growth in various subjects, including mathematics. One highlighted,

Library serves as more than just places for borrowing books; it is not useful spaces for studying and collaboration (S47).

Theme 6. Self-Consciousness in the Study Environment

Some students express self-consciousness about studying mathematics in the library, citing its uncommonness among their peers. This sense of unease reflects broader societal norms and expectations surrounding academic behaviours, wherein deviating from the perceived norm can lead to discomfort or reluctance to engage in certain activities in public spaces. One underlined,

I feel self-conscious studying math in the library because it seems uncommon compared to what my peers are doing (S30).

Theme 7. Preference for Classroom Study

Despite the availability of library resources, students often prefer studying mathematics in their classrooms. They cite

familiarity with the environment and access to personal study materials as primary reasons for this preference. This underscores the importance of comfort and convenience in students' study habits, with familiar surroundings and easy access to materials influencing their choice of study location. One highlighted,

I find it more engaging to study mathematics in our classrooms rather than libraries; interacting with my peers and teacher helps me understand the concepts better (S01).

Theme 8. Limited Mathematics-Specific Resources

The researcher noted a deficiency in mathematics-specific resources within the libraries of both schools. This lack of adequate textbooks and reference materials for mathematics education further diminishes the library's appeal as a viable study space. Without sufficient resources catering to their needs, students are less likely to utilise the library for a mathematics study. As one indicated,

Not enough resources for math students here (S12).

Theme 9. Frequency of Library Usage

The interviews reveal that most students rarely or never use the library for mathematics study, with 80% of the interviewed sample falling into this

category. This finding underscores the disconnect between the availability of resources and students' utilisation of library spaces for mathematical learning. It also highlights the need for targeted interventions to promote library usage among students for academic purposes. One highlighted,

I have always been more of a self-learner when it comes to math. The library is great for some subjects, but I find math easier to hold when I tackle it independently using textbooks (S45).

Theme 10. Impact of Lack of Awareness

The lack of awareness about library resources is a prominent factor contributing to students' underutilisation of the library for mathematics study. With 65% of interviewed students admitting to not knowing what mathematics resources are available, there is a clear need for improved communication and outreach efforts to inform students about the breadth and depth of resources available. One said,

Excuse me, I am not sure what math resources I have access to. Could you point me in the right direction? (S06).

Theme 11. Inconvenience as a Barrier

Nearly half of the interviewed



students cite inconvenience as a reason for not using the library for mathematics study. This suggests that despite the potential benefits of library resources, students prioritise convenience and accessibility when choosing study locations. Addressing convenience issues, such as extending library hours or improving facilities, could help mitigate this barrier and encourage greater library usage for mathematics study. One underscored,

I would love to use the library for math study, but it is too inconvenient. With my packed schedule, finding the time to travel to the library, searching for relevant materials, and then studying, there is just too much disturbance (S34).

Theme 12. Opportunities for Intervention

The findings underscore the need for targeted interventions to address the observed patterns of underutilisation of library resources for mathematics study. By raising awareness about available resources, improving the library environment, and raising a culture that values the library as a space for academic pursuit in all subjects, educators and librarians can create a more inclusive and supportive learning ecosystem for students.

In focus group discussions, students said they felt more comfortable studying mathematics at home or with peers than using the library. Students expressed concerns about the library's atmosphere, with some feeling that it was not conducive to focused study due to noise levels and a lack of designated mathematics study materials. Some students mentioned that they found it easier to concentrate in their own spaces because they could control their study environment, which was impossible in the library. Some students stated that teachers or librarians never informed them about the mathematics materials present in the library. Peer pressure and the desire to fit in significantly influenced students' decisions regarding library utilisation for mathematics study. Students expressed concerns about the library's physical environment not conducive to focused mathematics study. Students suggested that the library could benefit from additional mathematics textbooks, access to online math tutorials, and workshops or study groups for mathematics.

The observation revealed that students prefer studying mathematics with their peers rather than in the library due to concerns about its atmosphere. Noise levels and a lack of designated mathematics study materials contribute to

their discomfort. Additionally, some students were unaware of the mathematics resources available in the library, indicating a communication gap between teachers, librarians, and students. The library's physical environment is perceived as not conducive to focused mathematics study. Students need mathematics textbooks, access to online math tutorials, and workshops or study groups to enhance their learning experience.

Discussion

The findings indicated that the library was underutilised for mathematics study among ordinary public secondary students. This low utilisation was due to students' preferences for studying at home or with peers. The lack of awareness about available mathematics resources in the library suggests a need for librarians and teachers to improve communication and outreach. Students should be informed about the resources that can aid their mathematics learning. Peer influence plays a significant role in students' decisions to use the library for mathematics study. Addressing this influence and raising a culture of library usage for academic purposes could encourage more students to utilise the library's resources. Students' concerns about library hours, seating, and lighting should be addressed to make the library a more appealing and conducive

environment for mathematics study. Flexible hours and improved facilities can help overcome these barriers. Therefore, the findings showed that efforts should be made to raise awareness about mathematics resources in the library, address peer influence, and improve the library's physical environment to promote its utilisation for mathematics study among ordinary public secondary students. Effective communication, support from teachers and librarians, and modifications to the library space can play a crucial role in achieving this goal.

The current findings align with Mbarute and Ntiyuguruzwa (2023), highlighting that libraries provide an optimal environment for focused study essential for mastering intricate mathematical concepts. However, the current findings contrast with those of Tsang and Chiu (2022), who evaluated library services' adequacy based on factors like resource quality and access rather than emphasising the conducive study environment. Moreover, the findings are consistent with Ajani et al. (2024), highlighting libraries' role as dynamic learning hubs offering not only books but also invaluable resources, guidance, and support, thus enhancing students' academic activities beyond mere book repositories.

Conclusion



The study highlighted a concerning trend of underutilising libraries among ordinary public secondary students for mathematics study. The reliance on textbooks and classroom notes while neglecting the rich resources and support available in libraries indicates a missed opportunity for enhancing learning experiences. Factors such as lack of awareness, limited access, and misconceptions about the purpose of libraries contribute to this underutilisation. However, it was encouraging to note that students who utilised the library for mathematics study found it beneficial, emphasising its potential as a valuable resource. Moreover, the positive feedback regarding the quiet and conducive study environment provided by libraries underscored their importance as conducive spaces for learning. Promoting library utilisation among secondary students could yield significant educational benefits, enhance access to resources, and create a culture of lifelong learning.

Recommendations

Schools should arrange collaborative awareness movements with education authorities to strengthen engagement with library resources for mathematics study, targeting students and teachers alike. These initiatives could encompass diverse strategies such as

distributing posters, conducting workshops, and making regular classroom announcements while enhancing library facilities and services.

Ethics Statement: At this moment, we declare that research/publication ethics and citing principles have been considered at all stages of the study. We take full responsibility for the paper's content in case of dispute.

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