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# Laboratory Facilities of Library and Information Science Students Concerning Academic Performance of the Programming Fundamental Course

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**ABSTRACT**

This study aims to explore the relationship between the availability of computer laboratory facilities and the academic performance of Bachelor of Library and Information Science (BLIS) students in the Programming Fundamentals course. Data were collected through surveys and interviews, examining variables such as the availability and frequency of use of computer laboratories, students' programming proficiency, and their academic performance measured by their General Weighted Average (GWA). Data were analyzed using a mixed-methods approach. The results highlight a notable correlation between the utilization of well-equipped computer laboratories and enhanced academic performance in programming courses. The test result shows a strong positive correlation coefficient and is statistically significant. The findings offer valuable insights that may shape not only the strategies of academic institutions but also the aspirations and accomplishments of aspiring BLIS professionals who will help define the information landscape of the future.

## INTRODUCTION

From an international perspective, the Bachelor of Library and Information Science (BLIS) program is a crucial domain within the field of library and information science. It equips students with essential knowledge and competencies to excel in the digital age. Among the core components of this academic journey in the programming fundamental course, is a linchpin that fosters proficiency in the art of computer programming. Fakari (2021) defines a programming fundamental course that equips students with the knowledge and abilities needed to apply computation and computer programming in engineering applications. In this course, students develop programming skills through assignments, labs, case studies, and example programs. The goal is proficiency in writing small to medium programs in a procedural programming language. However, the path to programming proficiency is multifaceted, with various factors impacting a student's trajectory.

The availability of computer laboratories, which are essential to the effective teaching of computer studies, is a barrier for BLIS students. Onwubere (2023) mentioned how important it is to use resources such as textbooks and computer labs. These technologically advanced laboratories provide hands-on learning opportunities and are integral parts of the curriculum. The computer laboratory is more than a physical space; it becomes a hub for exploration, experimentation, and collaborative learning. Brimming with resources, software, and opportunities for hands-on practice, these facilities are considered the 2 birthplace of practical programming skills. They provide a space where theory meets practice, allowing students to code, troubleshoot, and innovate.

This research delves deep into the pivotal connection between computer laboratory facilities and the academic performance of BLIS students in the Programming Fundamentals course. It aims to unravel how these state-of-the-art learning environments influence not only the acquisition of programming knowledge but also the broader educational journey of students. Beyond technical proficiency, the study investigates how such access affects other aspects of the student experience, such as the growth of critical thinking, the improvement of creativity, and the development of problem-solving abilities. The main goal is to comprehend how these computer labs function as both physical locations and intellectual boosters, whereby the real-world implementation of programming concepts serves as a bridge to improved academic achievement.

Furthermore, Merck (2023) stated that inadequate or nonexistent ICT infrastructure, especially in underdeveloped countries, can significantly hinder computer studies education. The use of computer lab facilities affects more than just running code; it touches on the fundamentals of learning and development as we explore the relationship between technology, education, and performance. This research aims to contribute valuable insights that may shape not only the strategies of academic institutions but also the aspirations and accomplishments of aspiring BLIS professionals who will help define the information landscape of the future.

## MATERIALS AND METHODS

This study employs a mixed-methods research design, combining both quantitative and qualitative research methodologies. This approach allows for a comprehensive exploration of the relationship between computer laboratory facilities and the academic performance of Bachelor of Library and Information Science (BLIS) students in the Programming Fundamental course. The quantitative aspect involves the collection and analysis of numerical data. As highlighted by Sreekumar (2023), to monitor events that impact a sample population—a specific set of people—quantitative research approaches are employed. This research methodology entails collecting a variety of numerical data using various techniques, and then statistically analyzing the data to aggregate, compare, or show correlations between the data. A structured survey questionnaire will be administered to BLIS students, focusing on their perceptions of computer laboratory facilities. The survey will include items related to respondents' profiles, computer laboratory facility usage among BLIS students, considering the availability of computer laboratory facilities and the number of computers available or usable, and the students' programming fundamentals proficiency in terms of their General Weight Average (GWA). Additionally, academic performance metrics such as grades, test scores, and project outcomes will be quantitatively measured and analyzed. Statistical techniques, including correlation analysis, will be applied to examine the quantitative relationships between students' perceptions and their academic achievements.

The qualitative component aims to provide a deeper understanding of the experiences and perspectives of BLIS students regarding computer laboratory facilities. As underscored by Tenny, S. (2022), one type of investigation that aims to explore and provide a deeper understanding of real-world problems is qualitative research. Qualitative research contributes by developing hypotheses and exploring a deeper understanding of quantitative data, in contrast to quantitative research, which entails the collection of numerical data or the application of interventions and treatments. This methodology involves the collection of participants' experiences, perceptions, and behaviors, addressing questions related to the processes and reasons behind phenomena rather than focusing solely on numerical quantities. In-depth interviews will be conducted with a subset of participants, exploring their qualitative insights into the challenges, preferences, and overall experiences in utilizing these facilities.

Qualitative data from interviews will be analyzed thematically to uncover patterns, themes, and nuanced aspects that may not be captured through quantitative measures alone. The results from both quantitative and qualitative analyses will be integrated to offer a more holistic understanding of the research question. Triangulation, the comparison of findings from different methods, will be employed to validate and strengthen the overall conclusions. By combining quantitative statistical patterns with qualitative depth, the mixed-methods approach aims to provide a comprehensive and nuanced perspective on the relationship between computer laboratory facilities and the academic performance of BLIS students.

## RESULTS AND DISCUSSION

### Respondents' Profile

The respondents' profile covered the age, gender, and subject taught of the teachers handling general education subjects of the three community colleges in Misamis Oriental.

***Age***

It was found that the majority of respondents, totaling 35 individuals (47.30%), belong to the age category of 22 years old and above. This substantial representation implies a significant enrollment of older individuals in the programming fundamentals course. On the other hand, the youngest age group, comprising respondents aged 18-19 years old, is the least represented, with only 10 individuals (13.51%) falling within this category. The findings from Table 5 indicate that the highest number of respondents falls within the age bracket of 22 years and above in the surveyed population. This observation aligns with the assertion made by Papaya and Bagayna (2023), which underscores that age group and other demographic characteristics have a big influence on how many students participate in traditional in-person and online learning settings.

***Respondent's sex***

The overall data underscores a pronounced predominance of female students within the BLIS program. Specifically, female respondents make up the majority, totaling 60 29 individuals, or 81.08% of the total population. In contrast, male respondents are notably fewer, comprising only 14 individuals, or 18.92%. which implies that most of the respondents are female because most of the students enrolled in this program are female. The highest number of respondents is observed among female fourth-year BLIS students, comprising 36 individuals, which accounts for 48.65% of the total. Following closely are male second-year students, totaling 10 individuals, representing 13.51% of the respondents. In contrast, the lowest representation of male respondents is seen among third-year BLIS students, with a complete absence, accounting for 0% of the total. Conversely, female representation among third-year BLIS students stands at six individuals, constituting 8.11%. The data highlighted by Diane et al. (2019) indicate that women have historically held a dominant position in the profession of librarianship.

***Respondent's year-level***

It is evident that out of 74 participants, the majority, comprising 54.05%, are fourth-year students. Conversely, 37.84% are second-year students, and only 8.11% are in their 30 third year. Cereneo S. Santiago Jr. et al. (2021) suggest that the COVID-19 epidemic has changed educational systems, requiring a change from traditional to flexible learning methods. This shift may explain the higher representation of fourth-year students, as flexible learning options have encouraged many lifelong learners to return to school.

**The frequency of computer laboratory facility usage among BLIS students**

***Availability of computer laboratory facilities***

The total mean score for the availability of computer laboratory facilities is 3.19, which is interpreted as "Moderately Available." This indicates that, on average, students perceive the computer lab facilities as moderately accessible and useful for their learning needs. This moderate rating reflects a consensus that while the facilities are present and somewhat beneficial, there may be room for improvement in their accessibility or usage to better support students' academic endeavors.

Within this context, the highest-rated indicator is the statement, "The lab facilities play a major role in helping students comprehend and put Fundamentals of Programming topics into practice," which has a weighted mean of 3.66, interpreted as "Highly Available." This suggests that students find the computer lab facilities particularly effective in aiding their understanding and practical application of programming concepts. The effectiveness of these facilities aligns with Azriadi's (2018) assertion that students can have practical experience with computer systems in a computer lab facility. Peerapol (2019) further emphasizes that modern functions of computer labs are essential for increasing knowledge and skills, addressing performance issues, and increasing productivity.

Conversely, the lowest-rated indicator is the statement, "Library and Information Science students often use the computer labs designed for the Programming 33 Fundamentals," with a weighted mean of 2.74, interpreted as "Moderately Available." This lower rating indicates that the utilization of the computer labs by Library and Information Science students for programming fundamentals is moderate, suggesting a potential area for increased engagement or better access. Enhancing the utilization of these labs could amplify their benefits, as Ali (2020) notes that Computer laboratories can improve students' educational experiences.

***Number of Computers Available or Usable***

The overall mean score for the availability and usability of computer lab facilities is 2.94, which is interpreted as "Moderately Available." This indicates that, on average, students perceive the computer facilities as moderately sufficient for their needs. Among the specific indicators, the statement, "To help students grasp the principles of programming, I believe that more computer facilities are required to support the current computer units in the computer lab," received the highest mean score of 3.74. This score indicates that students find the usage frequency of computer laboratory facilities based on the number of available and usable computers to be highly available. This suggests a strong perceived need for additional computer resources to support effective programming education, aligning with Mercado et al. (2022), which emphasizes that the hands-on experience and tangible interactions provided in a laboratory setting significantly enhance the learning process, making abstract concepts more concrete and understandable for students.

In contrast, "There are enough computers in the lab to accommodate every student in the library" received the lowest mean score of 2.38, interpreted as "Rarely Available." This indicates that students feel there are insufficient computers in the lab to meet the needs of every student, highlighting a gap in resources that may hinder optimal learning experiences. Despite the availability of personal computers at home, students still require well-equipped laboratories and teaching facilities to foster innovation and research, as underscored by Nelmida Fernado (2019). Home computers, while useful, do not fully meet the comprehensive educational needs of students, necessitating robust lab facilities. Students who get access to computers early have more time to practice and complete tasks. This can create an uneven playing field, where some students have a clear advantage due to an access issue, hindering overall learning outcomes for the class. In conclusion, insufficient computers in the lab lead to a resource gap that creates frustration, time pressure, and unequal learning opportunities. This can significantly hinder students' ability to achieve optimal learning experiences in a technology-driven curriculum.

**Students' programming fundamentals proficiency**

***General Weight Average (GWA)***

The data reveal that the highest frequency of proficiency, encompassing 35 students (47.30% of the respondents), is observed at the "Satisfactory (Approaching Proficiency)" level. This indicates that nearly half of the students achieved a General Weight Average (GWA) in the range of 80%-84%. This level of proficiency suggests a solid understanding and competency in Programming Fundamentals among these students. 40 Conversely, the lowest proficiency level identified is "Outstanding (Advance)," attained by five students comprising 6.76% of the total. These students achieved an impressive GWA of 90% or higher, demonstrating exceptional performance and a profound mastery of programming fundamentals. It's noteworthy that no students scored below 75%, indicating that all respondents met or exceeded the basic expectations for proficiency in programming. This overall achievement underscores the effectiveness of the educational approach and the commitment of students to excel in their studies. Simões (2022) emphasizes that students who use computers more often get more confident in their ability to use them, which enhances performance. This insight aligns with the proficiency levels observed, suggesting that active engagement with programming tasks and technologies contributes to students' success in mastering Programming Fundamentals.

**Respondents' experiences in using computer laboratories**

***Availability of Computer Laboratory Facilities***

From the responses of the respondents during the conduct of the focus group discussion, the following theme emerged: Limited access to learning materials. This theme, along with categories, is discussed in the succeeding paragraphs.

***Number of computers available***

Research and learning materials are heavily digitized these days. From programming, online databases, and academic journals to e-textbooks and educational software, computers provide a vast resource pool. Without them, students struggle to find the depth and breadth of information needed to excel in their studies. Research and learning materials are heavily digitized these days. From programming, online databases, and academic journals to e-textbooks and educational software, computers provide a vast resource pool. Without them, students struggle to find the depth and breadth of information needed to excel in their studies. Online platforms, such as programming, are a common tool for collaboration and communication in classrooms. Students without computers may have trouble working on group projects, accessing class materials shared online, or staying connected with teachers and classmates for updates or discussions.

Computer skills are crucial in today's world. Without access to computers, students miss out on developing these skills, putting them at a disadvantage compared to their peers. This gap can affect their performance in computer-based tasks or limit their ability to access online resources for future learning and careers. Overall, the lack of computer resources creates an uneven playing field for students. They struggle to access information, participate in online learning, develop essential digital skills, and collaborate effectively, all of which can hinder their academic performance.

***Limited access to learning materials***

Much educational content is now delivered online, from textbooks and assignments to lectures and educational resources. Students without computers may struggle to keep up with coursework or have difficulty finding the information they need to succeed. Hinders computer Knowledge Acquisition and Retention, such as Textbooks, online resources, practice problems, and other materials, provide students with the content they need to learn and solidify their understanding. Without them, students struggle to grasp complex concepts, retain information, and prepare for assessments. Limits Learning Styles and Engagement: Learning materials come in various formats—textbooks, articles, videos, simulations—catering to different learning styles. Limited access restricts students to methods that might not resonate with them, leading to disengagement and difficulty absorbing information. Students with access to a wider range of resources can delve deeper into topics, explore diverse perspectives, and practice more effectively. This creates an advantage compared to students with limited materials, widening the achievement gap. Learning materials empower students to go beyond the classroom curriculum and explore topics independently. Restricted access limits their ability to delve into areas of 43 interest, ask deeper questions, and develop a genuine love for learning. The struggle to find appropriate learning materials can be stressful for students. They might feel overwhelmed by the workload or inadequate preparation, leading to anxiety and hindering their ability to perform well. By addressing these issues and ensuring equitable access to a variety of learning materials, educators can create a more level playing field and empower all students to reach their full potential in programming.

***Difficulties with communication and collaboration***

Many schools and teachers use online platforms for communication and collaboration. Students without a computer may have trouble staying connected with classmates and teachers or miss out on important announcements. Clear communication is crucial in programming. When collaborating online, misunderstandings can easily arise due to a lack of face-to-face interaction, unclear documentation, or misinterpretations in text-based communication. These misunderstandings can lead to errors in code, requiring rework and delays. Effective collaboration allows programmers to leverage each other's strengths and perspectives. Difficulties with communication can hinder this process, making it harder to brainstorm solutions, identify and fix bugs efficiently, or effectively explain complex technical concepts. In large projects with multiple programmers, collaboration is essential for integrating different code sections seamlessly. Communication difficulties can lead to compatibility issues, version control problems, and unexpected bugs when merging code written by different team members. Frustration from communication problems can create tension and decrease team morale. Difficulty collaborating effectively can slow down progress, leading to missed deadlines and a decreased sense of accomplishment. Collaboration allows programmers to learn from each other's experiences and approaches. Communication difficulties can hinder this knowledge transfer, limiting opportunities for professional development and creating a situation where programmers might reinvent the wheel instead of building on existing solutions. Additionally, online collaboration and tools can sometimes introduce their challenges. By improving communication skills, adopting clear documentation practices, and utilizing effective online collaboration tools, programmers can overcome these challenges and work together more effectively to achieve better results.

**The significant relationship between the availability of the computer laboratory of the BLIS students and their academic performance.**

The data provides a significant insight into the relationship between the availability of computer laboratory facilities and the academic performance of Bachelor of Library and Information Science (BLIS) students. The table highlights a strong positive correlation coefficient of 0.66, indicating a robust relationship between the two variables. Furthermore, the associated P-value of 0.0001 underscores the statistical significance of this correlation, suggesting that the observed relationship is unlikely to have occurred by chance. Segundo (2020) underscores that proficiency is built on a solid foundation of basic programming concepts. Programming necessitates a structured approach where students first grasp fundamental language elements before advancing to more advanced strategies and the complete programming process. This layered learning approach ensures that students develop a comprehensive understanding and are adequately prepared for future challenges in their academic and professional pursuits.

The availability of computer laboratory facilities significantly influences BLIS students' academic performance. The strong positive correlation coefficient and the low P value affirm that students benefit from well-resourced learning environments that support their educational journey effectively. By providing access to necessary tools and practical experiences, such facilities enhance students' comprehension and application of programming concepts, thereby facilitating their overall academic success. The computer laboratory facilities not only support foundational learning but also contribute to students' readiness for the complexities of their chosen field. Ensuring 48 continued access to and improvement of such resources is crucial for maintaining high standards of education and preparing students for future professional challenges.

## CONCLUSION

The study explored the relationship between various factors—age, sex, year-level, computer lab usage, and academic performance—among BLIS students. The respondents' profile showed a predominance of female students, particularly fourth-year students, and a majority of students were in the 22-year-old and above age group. The data on computer laboratory facility availability indicated moderate accessibility and usage, with the highest rating given to its role in aiding programming practice. However, there was an evident gap in the number of computers available, as students expressed a need for additional resources to support their learning. These findings reflect the challenges faced by students in utilizing available resources effectively, which may impact their overall academic experience.

The study also examined the proficiency of students in programming fundamentals, finding that the majority were "Satisfactory" in their performance, with a few excelling at an "Outstanding" level. The results showed a significant positive correlation between the availability of computer labs and academic performance, suggesting that better access to learning facilities can lead to improved student outcomes. However, the study also noted that the use of the computer lab by students was not fully optimized, with limited usage of the facilities for programming-related tasks. This gap highlights the importance of maximizing access and utilization of the available technology to improve students' learning experiences.

In conclusion, the study underscores the critical role that adequate learning resources, especially computer laboratory facilities, play in enhancing students' academic performance. The positive correlation between computer lab availability and academic success emphasizes the need for continued investment in these resources. Additionally, the study suggests that educational institutions should focus on improving access to technology, fostering better communication and collaboration in learning environments, and ensuring that students are fully equipped to succeed in their academic pursuits.

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