

Impact of Computer Laboratory Resources on the Academic Performance of BSCS Students

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Abstract: *The current study examined the effect of computer laboratory resources on the academic performance of BSCS students at SNSU. A quantitative approach using descriptive-correlation design was used in gathering information from 59 participants using a valid survey instrument assessing five factors of computer laboratory resources including availability of computers, effectiveness of equipment, availability of internet and software, laboratory setting, and technical assistance. On the other hand, the construct of student engagement is considered the mediator, involving behavioral, emotional, and cognitive aspects of the phenomenon. The findings show that the factors related to computer laboratory resources were all rated high, with the factor Availability of Computers receiving the highest mean score (3.01) and the Laboratory Setting (2.87). In terms of Internet and Software Accessibility, it had the lowest mean score (2.56). For Student Engagement, it was also found to be high, with Behavioral Engagement having the highest mean score (3.05).*

Keywords: Computer Laboratory Resources, Academic Performance, Student Engagement, BSCS Students, Descriptive-Correlational

I. INTRODUCTION

In the past few years, laboratory facilities had received considerable attention owing to their impact on learning and the performance of students in various colleges. Laboratory facilities were very important for students pursuing computer science since they had to engage in programming and project work that required the use of computers and suitable software. Laboratory facilities made it possible for learners to connect theory with practice as they developed computer programming skills as well as problem-solving skills which allowed them to undertake complicated computing projects. It should be noted that not all colleges could afford to provide such laboratory facilities, which could influence learner performance.

This research paper sought to examine the influence that computer laboratory facilities had on the performance of BSCS students, focusing specifically on their performance in programming classes, practical programming abilities, as well as the quality of their projects. It was crucial to understand the effects of computer laboratory facilities on performance for those who wished to improve student performance and success academically and professionally.

There was evidence that suggested that exposure to technological and laboratory resources positively impacted academic performance. Research into virtual laboratories showed that virtual, interactive environments helped improve academic performance due to the practical opportunities they provided when other resources were limited (Bazie, Lemma, Workneh, & Estifanos, 2024). Research into how technology was used in educational settings showed that individuals who had regular access to ICTs were able to achieve better academic results (Lokpo, Deku, Donkor, & Kumah, 2023). Extensive research into ICT use found considerable associations between ICT adoption and student



academic performance in various fields of study (Liang, 2025). With regards to coding practice in particular, it was discovered that training in systematic coding was highly beneficial for developing computational and problem-solving skills essential for technical classes [7].

Although these findings had been established, there was little scientific literature devoted specifically to the relationship between computer laboratory facilities and the learning achievements of BSCS students measured in terms of programming courses, practical experience in programming, and performance in programming projects. Previous works had dealt with issues of ICT use for learning in general, but not the influence of computer lab facilities per se upon student performance in computing programs in particular. It could be seen thus why a study like this was warranted.

The research aimed to:

1. Determine the demographics of the respondents;
2. Analyze the adequacy of the computer laboratory resources concerning computers' availability, proper functioning of the equipment, availability of internet and software, atmosphere in the laboratory, and technical assistance;
3. Analyze students' involvement in the laboratories;
4. Study the connection between the computer laboratory resources and student involvement; and
5. Make suggestions for enhancing the computer laboratory resources and student involvement in the laboratory.

II. REVIEW OF RELATED LITERATURE

This chapter presented an overview of relevant literature regarding the use of computer lab resources and their impact on the engagement and performance of BSCS students. The chapter analyzed the influence of different components of computer lab resources, including the availability of computers, internet access, software, hardware facilities, and other resources.

A. Computer Laboratory Resources and Academic Performance

As regards computer science education, one of the significant spheres of research referred to the effect that technological resources had on students' academic success. Laboratory facilities represented the availability, usability, and quality of technological resources that were used for programming and computer work. Such resources included personal computers, access to the Internet, software, and other necessary facilities. Research showed that the availability of necessary technological facilities led to the improvement of students' academic success. In their study, Barile, Elliott, and McCann (2024) found out that active involvement in virtual learning contributed to better academic performance because of increased participation and efficiency in studying. Similarly, Garcia-Machado, Martinez Avila, and Dospinescu (2024) noted that sufficient availability of academic facilities and resources positively influenced the learning process.

B. Availability of Computers and Learning Efficiency

Availability of computers was one of the important factors that helped students complete programming assignments efficiently. When a sufficient number of operational computers were available for students to use, they could practice programming, complete lab assignments, and study the subject more thoroughly. According to Dele and Francis (2025), lack of laboratory facilities resulted in poor academic success because of ineffective studying.

C. Internet Connectivity and Academic Engagement

Internet connectivity was an essential requirement when considering computing studies. Reliable internet access was required for performing research, utilizing learning applications, and acquiring programming knowledge. Lack of connectivity or unreliable access affected the instruction process and reduced the level of participation among students. Research indicated that those students who had stable high-speed internet connection tended to be more involved in the



learning process than their counterparts. According to Barile et al. (2024), having better access to internet resources enabled learners to interact with learning materials, improving their performance.

D. Software Tools and Skill Development

Having the latest and working software tools was considered one of the major determinants influencing the performance level of learners. Programming software, applications, and development tools helped learners convert their acquired knowledge into practice. From a research perspective, it was found that having proper software tools enable learners in gaining programming skills. Escubido, Laborte, and Bangcas (2025) found a positive relationship between ICT implementation and student performance. They indicated that better student performance was attained through the provision of adequate technology tools to students.

E. Hardware Facilities and Learning Environment

Hardware facilities were comprised of the computer equipment, peripherals, and lab equipment. Effective hardware facilities helped create a good learning environment since students were able to do their work uninterrupted if there was no problem with the hardware equipment. Poor hardware facilities brought about frustration among learners since they were not productive.

F. Student Engagement as a Mediating Factor

The intermediate variable under consideration was student engagement, which played an important role in explaining the connection between computer laboratory resources and achievement. The term engagement meant the active participation of students in learning processes, such as discussion, task solving, and peer cooperation. According to Student Engagement Theory, active participants in learning processes performed better academically. There was empirical evidence that the provision of sufficient resources facilitated the engagement process. Students were more willing to engage in coding and learning programming when appropriate resources were available, which, in turn, helped them perform better in their studies.

G. Synthesis

It was evident from the literature review that computer lab resources such as the presence of computer hardware, internet facilities, and computer software played a very important role in influencing the students' level of engagement in learning and performance. Those students who were sufficiently provided with the resources were able to engage more actively in learning activities and achieved better grades. In this way, student engagement played an important mediating role between the lab resources and academic achievement.

III. METHODOLOGY

H. Conceptual Framework

The present research was based on the integration of both Educational Technology Theory and Student Engagement Theory. The use of appropriate technologies played an essential role in influencing the level of student performance since its efficient use ensured the successful performance of the learning process. The conceptual framework demonstrated the connection between Computer Laboratory Resources (independent variable) and Academic Performance of BSCS Students (dependent variable). Student Engagement acted as a mediating variable within the model under discussion.

Computer Laboratory Resources were characterized by five dimensions: Availability of Computers, Internet Connectivity, Software Tools and Hardware Facilities. Academic Performance consisted of Programming Course Grades, Practical Coding Abilities, and Output Quality of Projects.



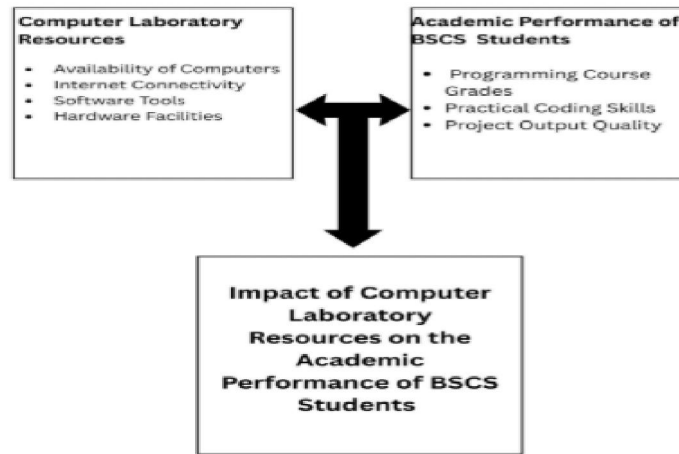


Figure 1: Conceptual Framework of the Study

I. Sampling Techniques

The population for this study comprised BSCS students registered at Surigao del Norte State University (SNSU) for the year 2025–2026. Non-probability sampling was used, more specifically convenience and voluntary response sampling. The research team distributed the survey questionnaire to the target respondents via the internet as well as by distributing it inside classrooms. A total of 59 respondents took part in the survey; they included only those who were currently registered at SNSU and had already used the computer laboratory facilities at the university.

J. Research Design

This study used a quantitative research design, specifically a descriptive-correlational approach. This is to determine the relationship between computer laboratory resources and the academic performance of BSCS students at Surigao del Norte State University. The descriptive part focused on identifying the level of computer laboratory resources and student engagement, while the correlational part looked into whether significant relationships existed between the laboratory resources and academic performance indicators such as performance in programming courses, practical coding skills, and project output quality. The proponents considered this design appropriate because it allowed to describe the variables and examine their relationships without manipulations, which was suitable for an educational setting where variables naturally occur (Devi et al., 2022; Leavy, 2022).

K. Research Instrument

The main tool used in this research study was a questionnaire based on the theoretical framework as well as supported by the relevant literature. The tool consisted of three major parts that included: (1) Computer Laboratory Facilities involving the provision of computers, computer facilities functioning, internet and software availability, computing laboratory settings, and technical assistance; (2) Student Engagement covering behavioral, affective, and cognitive engagement; and (3) Academic Performance concerning programming skills, task completion, lesson understanding, knowledge application, and output quality.

In order to measure the degree of participants' agreement with each item of the questionnaire, a four-point Likert scale was applied: 4 (3.26-4.00) = Very High; 3 (2.51-3.25) = High; 2 (1.76-2.50) = Low; 1 (1.00-1.75) = Very Low. In such a way, a four-point scale does not include a neutral middle point and, consequently, minimizes the risk of central tendency bias (Kusmaryono et al., 2022).



L. Statistical Tools

The technique of descriptive statistics was used to identify the demographic composition of the respondents using frequency and percentages. For the assessment of the extent of laboratory resources, student involvement, and academic achievement, weighted mean was utilized. In order to identify the top and bottom ranked dimensions, ranking was performed based on mean scores. All the calculations involved in the study were performed through Microsoft Excel software at significance level of $\alpha = 0.05$.

IV. RESULTS AND DISCUSSION

M. Profile of the Respondents

As shown in Table 1, the majority of respondents were 19 years old, comprising 37.29% of the total, followed by those aged 18 years (23.73%) and 22 years (16.95%). Most respondents were female (61.02%), while male respondents accounted for 35.59%, with 3.39% preferring not to specify. In terms of year level, first-year students comprised the majority (84.75%), reflecting that the study primarily captured the experiences of beginning BSCS students who are still developing their programming skills and heavily reliant on laboratory resources. Most respondents had a GWA of 2.00-2.49 (69.49%), indicating satisfactory academic performance.

Table 1. Profile of the respondents including age, gender, year level, and GWA.

Profile	Frequency (f)	Percentage (%)
Age		
18 years old	14	23.73%
19 years old	22	37.29%
20 years old	7	11.86%
21 years old	3	5.08%
22 years old	10	16.95%
23 years old	1	1.69%
25 years old	2	3.39%
Gender		
Female	36	61.02%
Male	21	35.59%
Prefer not to say	2	3.39%
Year Level		
First Year	50	84.75%
Second Year	7	11.86%
Third Year	0	0.00%
Fourth Year	0	0.00%



GWA Last Semester		
1.00–1.49	2	3.39%
1.50–1.99	1	1.69%
2.00–2.49	41	69.49%
2.50–3.00	12	20.34%
Total	59	100.00%

N. Level of Computer Laboratory Resources

As depicted in Table 2, all dimensions associated with the laboratory computers were evaluated as high according to the perspective of students, who felt that the computers present in the laboratory settings were adequate and functional. Amongst these dimensions, Computer Availability had the highest mean value of 3.01, followed by Technical Support with 2.98, Laboratory Environment with 2.95, Computer Functionality with 2.78, and finally Internet/Software Availability with 2.56. All dimensions concerning laboratory computing were rated very highly from the result as shown in Table 2 above. This was the perception of the learners on how the computer laboratory was adequately used in their learning process.

Table 2. Level of Computer Laboratory Resources Across Dimensions

Computer Laboratory Resources Dimensions	Overall Mean	Interpretation
Availability of Computers	3.01	High
Equipment Functionality	2.78	High
Internet and Software Accessibility	2.56	High
Laboratory Environment	2.95	High
Technical Support	2.98	High

N. Level of Computer Laboratory Resources

It was evident from Table 3 that all the categories of engagement studied in this research belonged to the High category, showing that the learners were highly engaged during computer lab classes. The highest average value was shown by Behavioral Engagement (3.05), which indicated the participation of the learners in the lab activities and following instructions. On the other hand, Cognitive Engagement indicated that the learners tried to understand lab activities and critically reflected upon their programming. Even though Emotional Engagement was high too, the lowest average belonged to it, showing that learners faced stress or demotivation in programming activities.

Table 3. Level of Student Engagement Across Dimensions

Student Engagement Dimensions	Overall Mean	Interpretation
Behavioral Engagement	3.05	High
Emotional Engagement	3.00	High
Cognitive Engagement	3.01	High



O. Relationship Between Computer Laboratory Resources and Student Engagement

Table 4 showed that all the engagement measures showed consistent High ratings for each dimension, thus proving the existence of a relationship between laboratory resources and engagement levels. The rating on the dimension of computer availability showed the highest engagement mean score (3.05), showing that sufficient availability of computers was an important resource to facilitate the engagement process. The functionality of equipment was shown to have high engagement means due to the fact that functional equipment allowed students to accomplish tasks without distractions. On the other hand, Internet and software availability had relatively low engagement means than the rest of the dimensions.

Table 4. Level of Student Engagement by Computer Laboratory Resource Dimension

Computer Dimension	Laboratory Resources	Behavioral	Emotional	Cognitive
Availability of Computers		3.05 (High)	3.00 (High)	3.01 (High)
Equipment Functionality		2.98 (High)	2.90 (High)	2.95 (High)
Internet and Software Accessibility		2.76 (High)	2.86 (High)	3.00 (High)
Laboratory Environment		2.98 (High)	3.02 (High)	3.05 (High)
Technical Support		3.01 (High)	3.02 (High)	3.05 (High)

The consistently high scores suggested that having computer lab facilities had a positive impact on the level of engagement among BSCS students. This was in agreement with the concepts presented by theories in Educational Technology and Student Engagement. They showed that sufficient technology and the engagement of the learners were essential contributors to academic success [2][5].

V. CONCLUSION

This study explored the impact of computer laboratory resources on academic performance among BSCS students enrolled in SNSU Main Campus. Based on the results obtained from this study, the following conclusions were derived:

First, computer laboratory resources played an important role in shaping the academic life of BSCS students. The use of computers, availability of laboratory equipment, connectivity to the internet, access to software, conducive laboratory environment, and technical assistance all made the learning experience of BSCS students more enriching in their learning process.

Second, the level of student engagement among BSCS students in computer laboratories was relatively high. The BSCS students actively took part in laboratory activities, remained motivated, and tried hard to understand the programming lessons assigned to them.

Third, computer laboratory resources helped promote student engagement and academic performance. With increased access to technological resources, BSCS students were expected to improve their programming skills and perform better in laboratory exercises and in their studies.

Fourth, the findings of this research confirmed that Educational Technology Theory and Student Engagement Theory held true, since it showed that access to technological resources and student engagement improved the quality of learning and student performance.



Fifth, access to the internet and software turned out to be the most critical dimension that needed improvement, based on the lowest average score compared to the other dimensions of computer laboratory resources.

VI. RECOMMENDATIONS

First, there was a need for the university administration to continue improving the computer laboratory facilities through an increase in the number of computers, laboratory equipment, and the provision of a stable internet connection to meet the needs of the students.

Second, there was a need for lab managers and technical personnel to improve the technical assistance provided to ensure continuity of laboratory work and efficient handling of issues related to technological glitches that occurred within the lab.

Third, BSCS lecturers should continuously incorporate practical laboratory sessions and programming activities that encouraged students' participation.

Fourth, students should take full advantage of the available laboratory facilities in order to improve their programming skills, participation levels, and academic performance.

Fifth, there could be a consideration of enhancing internet facilities to ensure that the gap in access to internet and software tools was addressed.

Sixth, future researchers could replicate the study with larger samples and other variables.

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