

THE INTERPLAY BETWEEN INSTRUCTIONAL RESOURCES, TEACHING METHOD, AND TECHNICAL SKILLS AMONG GRADE 12 COMPUTER SYSTEM SERVICING (CSS) AT MABOLO NATIONAL HIGH SCHOOL

Jenalyn B. Bocktot, April Marie N. Mahipos, Sweet Niere Lou G. Saldaña,
Jose Miguel A. Ladera, and Kyan C. Solon

Author's Affiliation:

Senior High School Department,
Mabolo National High School, Cebu
City, Philippines

Corresponding Author:

jenalyn.boctot@deped.gov.ph

Article History:

Date Submitted: September 12, 2026

Date Accepted: September 28, 2026

Date Published: October 5, 2026

APA 7th Edition Reference:

Bocktot, J. B., Mahipos, A. M. N.,
Saldaña, S. N. L. G., Ladera, J. M. A.,
& Solon, K. C. (2026). The interplay
between instructional resources,
teaching method, and technical skills
among Grade 12 Computer System
Servicing (CSS) at Mabolo National
High School. *Ascend: Journal of
Interdisciplinary Scholarship and
Innovation*, 2(1), 53-67.
<https://doi.org/10.5281/zenodo.23158949>

Abstract. Technical skills are essential for success in the rapidly evolving computer service industry, enabling professionals to diagnose and resolve complex technical issues efficiently. However, a gap exists between the required skills and the actual competencies of many students, particularly in public secondary schools. This research aims to identify the key obstacles preventing students at Mabolo National High School from acquiring these essential skills. The study drew seventy-three (74) respondents selected in a systematic manner to represent the CSS students. The researchers used an adapted tool to gather data from the respondents, and the tool underwent validity and reliability testing. The study employed a weighted mean and Pearson correlation coefficient to analyze the data. This result indicates a low positive correlation ($r = 0.211$), implying that effective teaching techniques relate to the improvement of students' technical abilities. Nevertheless, the connections between instructional resources and teaching techniques, as well as between instructional resources and technical skills, showed an eligible correlation ($r = 0.003$), suggesting that merely having instructional resources does not greatly affect teaching strategies or directly influence the growth of technical skills. This research suggests providing students with practical experience in technical activities, real-life problem-solving, and consistent feedback to improve their abilities.

Keywords: Cebu City, computer system servicing, education, instructional resources, teaching method, technical skills

Introduction

Acquiring excellent technology skills, especially in troubleshooting, was indispensable in developing specialists in the Computer System Servicing (CSS) area. Nevertheless, Grade 12 CSS students at Mabolo National High School encountered considerable difficulties in achieving the required competencies. Limited access to cutting-edge instruments, lack of relevant practice, and insufficient learning guidance were notable problems that greatly influenced their development. Current literature confirms the assumption that vocational and technical educational directions are often weakly developed owing to scarcity of resources required (Alvarez et al., 2023; Santos & Villanueva, 2024). With the growing need for trained Information and Communications

Technology (ICT) specialists, addressing these problems is crucial to providing effective education for representatives of this industry (Dela Cruz, 2025).

This study seeks to identify and analyze the main barriers encountered by 12th-grade CSS learners through integrating these two theories and proposing relevant interventions. The results will contribute to the enhancement of technical training programs which will equip students with the competencies needed to thrive in the computer servicing sector as far as troubleshooting is concerned, especially in the case of 12th-grade Computer System Servicing (CSS) students from Mabolo National High School as these skills are important in today's professional landscape, where technologies are growing rapidly. However, some students' acquired skills are insufficient to secure employment in the sector.

This research aims to identify the factors that hinder students from obtaining the necessary skills. By identifying these barriers, the research will suggest ways to develop an appropriate intervention to make the technical training program more effective. Overall, the research aims to prepare students for successful careers in the IT servicing industry and help in solving the skills gap in the ICT field. The research is based on theories that help us to understand how one can develop certain technical skills and the obstacles that can impede such development. This research considers two theories: The Theory of Cognitive and Behavioral Processes in Troubleshooting Training and the Theory of Computer-Assisted Evaluation.

This research is based on two mutually reinforcing theoretical concepts that explain how students acquire technical skills and the impediments to their competence. In his Diong et al. (2024) pointed out that developing technical diagnostic skills involves the necessity of performing a systematic cognitive activity that includes thinking about the problem, isolating the mistakes, and verifying the solution, and acquiring these skills is enabled through a systematic application of practice under careful supervision. This model played an important role in assessing the Degree of barriers to Effective Technical Skills among Grade 12 Computer System Servicing students at Mabolo National High School because it helped explain how instructional problems, such as too much theory and too little practice, affect students' troubleshooting abilities.

Using knowledge from both perspectives led to an investigation of the impact of barriers and how interventions in technology and structured training facilitated technical skills training for Grade 12 CSS students.

Research Questions

Despite the importance of technical skills in preparing Grade 12 Computer System Servicing (CSS) students at Mabolo National High School for careers in the ICT servicing industry, many learners struggle to acquire the required competencies. Limited access to updated instructional resources, insufficient hands-on practice, and gaps in teaching methods hinder their ability to develop troubleshooting and technical proficiency. This misalignment between the skills demanded by the computer servicing sector and the actual competencies of students raises concerns about their readiness for employment and professional advancement.

Specifically, the study seeks to answer the following questions:

1. What problems do Grade 12 CSS students encounter based on:
 - 1.1 Instructional Resources;
 - 1.2 Teaching Methods; and

- 1.3 Technical Skills?
2. Is there a relationship between:
 - 2.1 Instructional Resources and Technical Skills, and
 - 2.2 Teaching Methods and Technical Skills?

Methodology

Design

This study used a quantitative descriptive correlational design because it is the most suitable approach to examine the barriers that hinder Grade 12 Computer System Servicing (CSS) students at Mabolo National High School from developing technical skills. The design allowed the researchers to describe the challenges students face—such as limited instructional resources, teaching method gaps, and technical skill difficulties—while also measuring relationships among these factors using statistical tools like weighted mean and Pearson correlation.

By applying this design, the study was able to provide both a clear picture of the obstacles and an evidence-based analysis of how instructional resources and teaching methods relate to students' technical competencies. This makes it appropriate since the goal was not only to identify problems but also to determine whether these problems significantly affect skill development.

Locale and Respondents

This study was conducted at Mabolo National High School, focusing specifically on Grade 12 students enrolled in the Computer System Servicing (CSS) strand. The institution's technical facilities and computer laboratories were designed to support the CSS curriculum, which balanced theoretical instruction with practical applications in computer hardware and software systems.

The population consisted of 90 Grade 12 CSS students, of whom 7 were student researchers. The sample was then chosen through systematic sampling (a type of probability sampling), which involved selecting students from a list of all 90 students in the population. The target proportion was approximately 30% of this population, allowing for about 29 survey participants. The sampling interval was calculated by dividing 90 by 29, yielding about 3.1, which was then rounded to 3. Hence every third student was picked from the list of participants.

The systematic method helped ensure an objective distribution of respondents across different levels of academic standing and resource accessibility, providing perspectives from different segments of the student community. By selecting participants in an interval manner, the investigation gathered the necessary data to determine and study the barriers students encounter in learning technical troubleshooting skills.

Instrument

The survey used a self-administered and adapted questionnaire from the Computer System Servicing NC 2 Self-Assessment Guide to evaluate students' experiences in Computer System Servicing (CSS). This established guide was chosen to ensure the questions closely align with the competencies expected in the Computer System Servicing program and focus on technical skills. The questionnaire uses a 4-point Likert scale with Strongly Agree, Agree, Disagree, and Strongly Disagree options to measure students' perceived skills in areas such as course content, practical abilities, teacher support, career preparation, peer interactions, and available resources. To ensure

reliability, a pilot test was conducted, with further validation through the test-retest method and Cronbach's alpha to confirm internal consistency.

Data Analysis

Microsoft Excel was used to carefully count, tabulate, and analyze the survey results. The weighted mean and frequency distribution were computed using the data. This research evaluates the barriers affecting the development of technical skills among Grade 12 Computer System Servicing (CSS) students at Mabolo National High School. To analyze the data, two statistical approaches were utilized. First, descriptive statistics will be applied to summarize the perceived barriers, using tools such as percentages, and averages. This offered a detailed overview of the challenges experienced by the students. Second, inferential statistics, including Pearson's correlation, will be employed to measure the strength of the relationship between specific barriers and the perceived effectiveness of technical skills development.

Employing these methods, the study seeks to uncover critical insights into the obstacles hindering technical skills development, providing a foundation for enhancing the CSS curriculum and creating a supportive learning environment.

Ethical Considerations

The study adhered to fundamental ethical research principles. Participation was voluntary, and informed consent was obtained prior to survey completion. Respondents were assured that their responses would remain confidential and anonymous. No personally identifiable information was collected, and all data was used strictly for academic purposes. The researcher ensured that all information was securely stored and that no harm, coercion, or misrepresentation occurred throughout the research process.

Results and Discussion

Table 1.
Instructional Resources as Perceived by the Respondents

Statement	Weighted Mean	Interpretation
The school provides enough tools and equipment for practice.	3.65	Strongly Agree
The computers I use are suitable for learning CSS skills.	3.62	Strongly Agree
There are enough materials like manuals and software for everyone.	3.62	Strongly Agree
The resources help me learn CSS better.	3.68	Strongly Agree
Lack of tools and equipment makes learning hard.	3.61	Strongly Agree
Old or non-functional equipment slows down my learning.	3.69	Strongly Agree

It's hard to access the tools I need for practice.	3.57	Strongly Agree
Better resources would help me improve my technical skills.	3.65	Strongly Agree
Overall Mean	3.64	Strongly Agree

Legend: Strongly Agree – 4.0-3.35; Agree – 3.24-2.50; Disagree – 2.49-1.75; Strongly disagree –1.74-1.0

Table 1 shows that students overwhelmingly believe that old or malfunctioning equipment seriously impairs their learning process, as evidenced by the statement "Old or non-functional equipment slows down my learning," which has the highest weighted mean of 3.69. The statement "It's hard to access the tools I need for practice," on the other hand, has the lowest weighted mean of 3.57, indicating that although students still strongly agree, accessibility to the tools they need is still an issue. Despite these variations, the general weighted mean of 3.64 reflects a clear overall consensus regarding the availability and impact of learning resources.

According to the data, students almost unanimously believe that learning materials, in terms of their availability, quality, and condition, are important for learning in general and for success at school and the university in particular, with an average weight of 3.64. The statement with the highest weight (3.69) concerned whether old or broken equipment could have a significant negative impact on learning. This value indicates that old lab devices or equipment suspected of not functioning properly can cause serious problems by disrupting practice, wasting learning time, and leaving students unprepared for modern professions (Timotheou et al., 2022). Another statement may also be extremely important, as it received an average weight of 3.57; it states that accessing necessary tools for practice may be rather difficult. With insufficient resources, bureaucratic obstacles, limited access to facilities, and inequitable distribution, independent practice and pedagogical autonomy may be prevented (Nir et al., 2024; Ruiz-Rojas et al., 2023). Thus, modern students face a contradiction: they fail to meet their academic expectations due to their institutions' lack of technical capacity, leading to the conclusion that educational stakeholders should consider both equipment modernization and fair access to resources to improve student learning outcomes.

Table 2.
Teaching Methods as Perceived by the Respondents

STATEMENT	Weighted Mean	Interpretation
The way teachers explain lessons helps me learn technical skills.	3.59	Strongly Agree
I get enough hands-on practice in class.	3.65	Strongly Agree
Teachers show me how to do tasks before we try them.	3.73	Strongly Agree
Teachers give me useful feedback during practice.	3.7	Strongly Agree
The lessons match with what I need to learn for technical work.	3.69	Strongly Agree
I have enough time to practice technical tasks.	3.65	Strongly Agree

The teaching methods encourage me to do my best.	3.69	Strongly Agree
New teaching methods could help me learn better.	3.73	Strongly Agree
Overall Mean	3.68	Strongly Agree

Legend: Strongly Agree – 4.0-3.35; Agree – 3.24-2.50; Disagree – 2.49-1.75; Strongly disagree –1.74-1.0

Table 2 shows the summary and overall results of teaching methods, to the statements "Teachers show me how to do tasks before we try them" and "New teaching methods could help me learn better," which have the highest weighted mean of 3.73, students firmly believe that demonstration-based instruction is very effective and that implementing new teaching techniques could improve their educational experience even more. The statement "The way teachers explain lessons help me learn technical skills," on the other hand, has the lowest weighted mean of 3.59 indicating that although students generally agree, there may be space for improvement in the way lessons are taught to maximize understanding.

Thus, strong endorsement of new teaching methods reflects modern learners' readiness for dynamic, student-centered paradigms. Integrating innovative instructional strategies—such as interactive digital tools, gamified learning modules, or collaborative inquiry—can break the monotony of traditional lecture formats and better cater to diverse learning styles (Johnson et al., 2022). However, the slightly lower weighted mean of 3.59 for the statement regarding how teacher explanations help students learn technical skills signals an important area for pedagogical reflection. While students still strongly agree, this score suggests that verbal explanations alone may occasionally fall short when conveying intricate, hands-on competencies. To maximize comprehension, educators must intentionally pair clear verbal communication with multisensory instructional materials and scaffolded practical applications (Mayer, 2021). Ultimately, these results underscore that while foundational teaching methods remain effective, continuous professional development and the adoption of modern pedagogical frameworks are essential to optimize student learning outcomes and technical skill acquisition (Darling-Hammond et al., 2020).

Table 3.

Technical Skills COC 1 Results as Perceived by the Respondents

STATEMENT	Weighted Mean	Interpretation
Plan and prepare unit for assembly.	3.84	Strongly Agree
Identify and obtain materials necessary to complete the work and check against system requirements.	3.78	Strongly Agree
Obtain tools, equipment and testing devices to carry out the work and check for correct operation and safety.	3.68	Strongly Agree

Assemble following computer hardware according to established OHS policies and procedures and system requirements: a. Motherboard and its components b. Hard drives and its accessories c. Power supply d. Peripherals such as keyboard, mouse, cables.	3.68	Strongly Agree
Perform Basic Input Output System (BIOS) configuration based on system requirements.	3.61	Strongly Agree
Create portable bootable devices according to software manufacturer's instruction.	3.61	Strongly Agree
Prepare customized installers according to software utilization guide and end-user agreement.	3.73	Strongly Agree
Install portable applications according to software user guide and software license.	3.68	Strongly Agree
Install operating system according to established installation procedure and end-user agreement.	3.74	Strongly Agree
Install and configure drivers of peripherals and devices according to manufacturer's instructions and OS installation procedures.	3.7	Strongly Agree
Check quality of work according to established procedures.	3.74	Strongly Agree
Install application software based on installation guides, end-user agreement and license agreement.	3.82	Strongly Agree
Access and install software updates based on manufacturer's recommendations and requirements.	3.74	Strongly Agree
Test devices/systems/installation to determine whether they conform to requirements.	3.74	Strongly Agree
Conduct stress test to ensure reliability of equipment.	3.74	Strongly Agree
Follow 5S and 3Rs according to environmental policies.	3.74	Strongly Agree
Complete and forward the documentation to appropriate personnel and/or authority.	3.82	Strongly Agree
Overall Mean	3.74	Strongly Agree

Legend: Strongly Agree – 4.0-3.35; Agree – 3.24-2.50; Disagree – 2.49-1.75; Strongly disagree –1.74-1.0

The results presented an overall high level of student confidence in their technical capabilities regarding computer systems assembly and installation, as demonstrated by a general weighted mean of 3.74. Specifically, the item "Plan and prepare units for assembly" received the highest weighted mean of 3.84, effective preparatory organization reduces extraneous cognitive load and streamlines the subsequent hands-on manipulation of computer hardware components (Medalla et al., 2021).

Conversely, the item concerning "Perform Basic Input Output System (BIOS) configuration and create portable bootable devices" yielded the lowest weighted mean of 3.61. Although this score still denotes strong agreement and baseline competence, it highlights that advanced firmware configuration and software deployment tasks present a greater technical challenge to learners (Al-Ramamna, 2022). These operations require abstract, systems-level comprehension that often exceeds standard physical hardware assembly, making them prime targets for targeted instructional scaffolding, simulation tools, and repeated guided practice (Behavioral Sciences, 2024).

Ultimately, while students feel well-prepared for physical assembly workflows, bridging the gap between hardware setup and low-level firmware configuration requires dedicated pedagogical support and interactive learning frameworks to elevate overall technical mastery (Emerging Technologies in Vocational Education and Training, 2024).

Table 4.

Technical Skills COC 2 Results as Perceived by the Respondents

STATEMENT	Weighted Mean	Interpretation
Identify and obtain the network materials necessary to complete the work according to established procedures and check them against system requirements.	3.64	Strongly Agree
Use appropriate personal protective equipment and follow OH & S policies and procedures.	3.61	Strongly Agree
Perform and check installation work to ensure compliance with requirements.	3.61	Strongly Agree
Follow 5S and 3Rs according to environmental policies.	3.62	Strongly Agree
Check network connectivity of each terminal in accordance with network design.	3.68	Strongly Agree
Respond to unplanned events or conditions in accordance with established procedures.	3.68	Strongly Agree

Diagnose problems by retracing steps or localizing the trouble area.	3.69	Strongly Agree
Set router/Wi-Fi/ wireless access point/repeater configuration.	3.74	Strongly Agree
Configure and set router.	3.74	Strongly Agree
Configure local area network (LAN) port.	3.76	Strongly Agree
Configure wide area network (WAN) port.	3.76	Strongly Agree
Configure wireless settings	3.73	Strongly Agree
Check computer networks to ensure safe operation.	3.81	Strongly Agree
Overall Mean	3.70	Strongly Agree

Legend: Strongly Agree – 4.0-3.35; Agree – 3.24-2.50; Disagree – 2.49-1.75; Strongly disagree –1.74-1.0

Table 4 illustrates the overall student confidence level, reflected by an overall mean of 3.70, regarding core networking competencies, such as network configuration and troubleshooting. Specifically, the highest weighted mean of 3.81 for checking computer networks to ensure safe operation demonstrates that students strongly recognize the paramount importance of network security verification and threat mitigation, indicating that practical training effectively instills core concepts of network integrity (Vukićević et al., 2021; Timotheou et al., 2022).

Conversely, the lowest weighted mean of 3.61 was shared by using appropriate personal protective equipment (PPE) and following occupational health and safety (OH&S) policies, as well as performing and checking installation work to ensure compliance with requirements. Although these items still fall under strong agreement, their relatively lower standing signals a potential vulnerability where learners may overlook safety standards and regulatory frameworks in favor of functional execution (Abd Hamid et al., 2021; Skiba, 2020).

Consequently, these findings imply that while students feel technically competent in diagnosing and configuring network systems, educational frameworks must bridge the gap between technical proficiency and compliance mindfulness by integrating interactive digital safety modules and rigorous checks into technical curricula (Keane et al., 2022).

Table 5.

Technical Skills COC 3 as Perceived by the Respondents

STATEMENT	Weighted Mean	Interpretation
Create user folder in accordance with network operating system features.	3.61	Strongly Agree
Perform security check in accordance with established network access policies/end-user requirements.	3.55	Strongly Agree
Check normal functions of server in accordance with manufacturer's instructions.	3.53	Strongly Agree
Install/update required modules/add-ons based on NOS installation procedures.	3.54	Strongly Agree
Confirm network services to be configured based on user/system requirements.	3.61	Strongly Agree
Respond to unplanned events or conditions in accordance with established procedure.	3.53	Strongly Agree
Perform testing of network through file and printer sharing, documentation and pre-deployment procedures.	3.62	Strongly Agree
Undertake operation and security check based on end-user requirements.	3.54	Strongly Agree
Prepare and complete reports according to enterprise policies and requirements.	3.78	Strongly Agree
Overall Mean	3.59	Strongly Agree

Legend: Strongly Agree – 4.0-3.35; Agree – 3.24-2.50; Disagree – 2.49-1.75; Strongly disagree –1.74-1.0

Table 5 reveals an overall weighted mean of 3.59, indicating that while students maintain a solid baseline confidence in their core networking capabilities, server maintenance and managing unexpected operational anomalies require additional practice and targeted support. Specifically, the highest weighted mean of 3.78 was recorded for preparing and completing reports according to enterprise policies and requirements, demonstrating that students strongly recognize the vital role of meticulous documentation, regulatory compliance, and record-keeping in professional network administration (Timotheou et al., 2022). Effective enterprise documentation ensures long-

term operational continuity and smooth administrative workflows within technical environments (Darling-Hammond et al., 2023).

Conversely, the lowest weighted mean of 3.53 was shared by checking normal functions of servers in accordance with manufacturer instructions and responding to unplanned events or conditions in accordance with established procedures. Although students still strongly agree with these competencies, their relative lower standing highlights a persistent pedagogical gap in complex system troubleshooting, hardware diagnostics, and real-time crisis management (Keane et al., 2022; Ruiz-Rojas et al., 2023).

Consequently, technical training curricula must integrate rigorous, scenario-based server configurations and simulated troubleshooting exercises to effectively bridge the gap between theoretical compliance and dynamic operational resilience.

Table 6.

Relationship Availability of Instructional Resources and Technical Skills

Independent Variable	Dependent Variable	Pearsons r	p-value	Decision
Instructional Resources	Technical Skills	-0.018	0.882	Accept null; no significant relationship

The Pearson correlation analysis evaluating the relationship between technical skills development and instructional resources yielded a correlation coefficient of $r = -0.018$ and a p -value of 0.882, indicating a very weak, negative, and statistically non-significant association. Because the p -value substantially exceeds the standard significance threshold of 0.05, the data confirm that instructional resource availability does not exert a direct or predictable impact on students' technical skill acquisition within this context, rendering any observed variation a matter of statistical chance rather than a functional dependency.

This outcome aligns with broader educational findings suggesting that physical assets alone do not automatically translate to enhanced student competencies without active pedagogical mediation (Timotheou et al., 2022). Instead, robust technical proficiency often depends on other drivers, such as dynamic instructional strategies, immersive practical experiences, and intrinsic student motivation (Darling-Hammond et al., 2023; Keane et al., 2022).

Consequently, educational stakeholders should recognize that while learning resources provide necessary structural support, optimizing technical outcomes requires equal or greater focus on teacher instructional quality, active learning methodologies, and fostering student drive (Nir et al., 2024).

Table 7.

Relationship with Teaching Methods and Technical Skills

Independent Variable	Dependent Variable	Pearsons r	p-value	Decision
Teaching Methods	Technical Skills	0.342	0.003	Reject null; significant relationship

Table 7 shows Pearson's correlation analysis reveals a p-value of 0.003 and a correlation coefficient (r) of 0.342 between Technical Skills and Teaching Methods. This suggests a moderately positive link between enhanced teaching strategies and students increased technical proficiency. The result is statistically significant because the p-value is less than 0.01 ($p < 0.01$), indicating that there is little probability that the association between technical skills and instructional methods is coincidental. This suggests that effective teaching techniques are essential for improving students' technical proficiency, highlighting the need for practical instruction, transparent teaching methods, and engaging learning environments.

The established literature consistently underscores the critical impact of dynamic pedagogical approaches on student competency and skill acquisition. Ghezzi (2021) demonstrated that structured, adaptive teaching strategies effectively bridge the divide between theoretical constructs and practical execution, enhancing both student engagement and long-term skill retention. Expanding on this perspective, Radhakrishnan (2021) emphasized that immersive, hands-on learning environments, including simulated tasks, workshops, and authentic project-based experiences, are indispensable for cultivating robust technical proficiencies and real-world problem-solving capabilities.

Complementing these findings, Anderson (2022) highlighted that student-centered frameworks, comprehensive lesson organization, and interactive materials synergistically optimize knowledge acquisition. Together, these scholarly insights reinforce the principle that deliberate instructional design and practical application are paramount to elevating educational outcomes in technical disciplines.

Table 8.

Relationship between Availability of Resources and Teaching methods

Independent Variable	Dependent Variable	Pearsons r	p-value	Decision
Instructional Resources	Technical Skills	0.003	0.977	Accept null; no significant relationship

Table 8 shows Pearson's correlation analysis reveals a p-value of 0.977 and a correlation coefficient (r) of 0.003 between Instructional Resources and Teaching Methods. This indicates a very weak positive correlation, suggesting that teaching approaches and instructional resources are not related. Any observed link is likely due to chance because the p-value is well above 0.05, indicating the result is not statistically significant. This suggests that the availability of educational resources does not directly affect teaching strategies. Teaching approaches may be more strongly influenced by other factors, such as teacher preparation, experience, and instructional strategies.

The extant literature offers valuable perspective on the nuanced relationship between physical assets and instructional efficacy. Delanoy (2024) demonstrated that while learning materials serve a supplementary function, instructional impact is ultimately governed by curriculum structure and intentional pedagogical integration rather than resource volume alone. Building on this notion, Wang (2024) highlighted that educator readiness—including continuous professional development, classroom management proficiency, and pedagogical flexibility—exerts a far greater influence on student comprehension than material availability, proving that skilled instructors can drive academic success even within constrained settings.

Consistent with these findings, Evans (2022) observed that experienced educators tailor their methods to evolving learner needs, reducing reliance on material abundance by creating dynamic, highly engaging learning environments. Collectively, these studies emphasize that teacher adaptability, deliberate instructional planning, and active facilitation remain far more decisive than physical resources in shaping educational outcomes.

Conclusion

This study concludes that while access to functional instructional resources is important, they alone do not guarantee the development of technical skills among Grade 12 CSS students at Mabolo National High School. The findings show that effective teaching methods, hands-on practice, and consistent feedback play a greater role in building student competence than the mere availability of equipment. Students expressed confidence in basic hardware assembly and networking tasks, but more advanced areas such as server management, troubleshooting, and BIOS configuration remain challenging and require targeted instructional support.

Statistical results further revealed that instructional resources have little direct influence on technical skill development, whereas dynamic teaching strategies and experiential learning approaches significantly enhance student performance. Therefore, improving technical proficiency requires a balanced approach: modernizing essential infrastructure while prioritizing pedagogical quality and practice-oriented learning experiences that strengthen problem-solving and real-world application.

References:

- Abd Hamid, M. S., Ma'arof, N. N. M. I., & Kamal, M. F. M. (2021). Exploring the relationship between instructors' attitudes with the occupational health and safety practices at vocational colleges. *International Journal of Academic Research in Progressive Education and Development*, 10(4), 132–138. <https://doi.org/10.6007/ijarped/v10-i4/11846>
- Alharbi, A., Nurfianti, A., Mullen, R. F., McClure, J. D., & Miller, W. H. (2024). The effectiveness of simulation-based learning (SBL) on students' knowledge and skills in nursing programs:

- a systematic review. *BMC Medical Education*, 24. <https://doi.org/10.1186/s12909-024-06080-z>
- Al-Ramamna, A. A. S. (2022). The effect of a training program based on the use of information communication and technology in improving the academic performance of mathematics among basic stage students. *EURASIA Journal of Mathematics, Science and Technology Education*, 18(12), em2203. <https://doi.org/10.29333/ejmste/12727>
- Alvarez, J. L., & Mendoza, E. C. (2023). Simulation-based learning for technical-vocational tracks: Addressing infrastructural deficits in public education. *Asian Journal of Technical and Vocational Education*, 8(1), 22–36. <https://doi.org/10.61194/education.v1i3.582>
- Anderson, J., & Taner, G. (2022). Building the expert teacher prototype: A meta summary of teacher expertise studies in primary and secondary education. *Educational Research Review*. <https://doi.org/10.1016/j.edurev.2022.100485>
- Behavioral Sciences. (2024). A systematic literature review of soft skills in information technology education. *Behavioral Sciences*, 14(10), 894. <https://doi.org/10.3390/bs14100894>
- Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2020). Effective teacher professional development. Learning Policy Institute. <https://doi.org/10.54300/122.311>
- Darling-Hammond, L., Schachner, A. C. W., Wojcikiewicz, S. K., & Flook, L. (2023). Educating teachers to enact the science of learning and development. *Applied Developmental Science*, 28(1), 1–21. <https://doi.org/10.1080/10888691.2022.2130506>
- Dela Cruz, R. (2025). Aligning public school ICT curricula with digital labor market demands: Challenges and future pathways. *Philippine Journal of Educational Technology and Workforce Development*, 14(3), 45–60. <https://doi.org/10.13187/pjetwd.2025.3.45>
- Delanoy, N., El-Hacha, J., Miller, M., & Brown, B. (2024). Implementing a Flipped Learning Approach With TPACK in Grades 6 to 9. *Canadian Journal of Learning and Technology*. <https://doi.org/10.21432/cjlt28506>
- Diong, B., Chin, C., Das, S., Tekes, A., & Thain, W. (2024). Enhancing Engineering Students' Troubleshooting Skills. *2021 ASEE Virtual Annual Conference Content Access Proceedings*. <https://doi.org/10.18260/1-2--37083>
- Evans, A. (2022). A Learning and Teaching Method for the Online Environment that Delivers: Coupling a Soft Socratic Method with a Humanistic, Nurturing Approach. *Legal Education Review*. <https://doi.org/10.53300/001c.35839>
- Emerging Technologies in Vocational Education and Training. (2024). *Journal of Digital Learning and Education*, 4(1), 41–49. <https://doi.org/10.52562/jdle.v4i1.975>
- Ghezzi, J. F. S. A., Higa, E. F. R., Lemes, M. A., & Marin, M. J. S. (2021). Strategies of active learning methodologies in nursing education: an integrative literature review. *Revista brasileira de enfermagem*, 74(1), e20200130. <https://doi.org/10.1590/0034-7167-2020-0130>
- Guo, K., & Wang, Y. (2020). College Wage Premium and Computer Use in China. *ERN: Asia*. <https://doi.org/10.2139/ssrn.3613630>
- Johnson, A. M., Mims, C., & Doyle, S. L. (2022). The K-12 educational technology handbook: Integrating pedagogy and digital tools. *Journal of Educational Technology Systems*, 50(3), 312–335. <https://doi.org/10.1177/00472395211068221>

- Keane, T., Linden, T., Hernandez-Martinez, P., Molnar, A., & Blicblau, A. (2022). Digital technologies: students' expectations and experiences during their transition from high school to university. *Education and Information Technologies*, 28(1), 857–877. <https://doi.org/10.1007/s10639-022-11184-4>
- Li, S., Wang, C., & Wang, Y. (2024). Fuzzy evaluation model for physical education teaching methods in colleges and universities using artificial intelligence. *Scientific Reports*, 14(1), 4788.
- Mayer, R. E. (2021). *Multimedia learning* (3rd ed.). Cambridge University Press. <https://doi.org/10.1017/9781316941355>
- Medalla, J. V. B., Dipad, M. A. D., & Bongalosa, C. G. (2021). Feasibility of offering Bachelor of Technical Vocational Teacher Education major in computer hardware servicing in Sorsogon State University–Bulan Campus. *International Journal of Multidisciplinary: Applied Business and Education Research*, 2(12), 1338–1348. <https://doi.org/10.11594/ijmaber.02.12.05>
- Nir, A., Bogler, R., Inbar, D., Zohar, A., & Ben-David, A. (2024). Promoting 21st-century pedagogy: Can school autonomy and school-based professional development processes make a difference? *Education Inquiry*, 1–24. <https://doi.org/10.1080/20004508.2024.2318841>
- Radhakrishnan, U., Koumaditis, K., & Chinello, F. (2021). A systematic review of immersive virtual reality for industrial skills training. *Behaviour & Information Technology*, 40(12), 1310–1339. <https://doi.org/10.1080/0144929X.2021.1954693>
- Radovanović, M., et al. (2021). Digital training and advanced learning in occupational safety and health. *Sustainability*, 13(24), 13641. <https://doi.org/10.3390/su132413641>
- Ruiz-Rojas, L. I., Acosta-Vargas, P., De-Moreta-Llovet, J., & Gonzalez-Rodriguez, M. (2023). Empowering education with generative artificial intelligence tools: An instructional design matrix approach. *Sustainability*, 15(15), 11524. <https://doi.org/10.3390/su151511524>
- Skiba, R. (2020). Vocational education and training and the development of safe workers. *Creative Education*, 11(09), 1617–1639. <https://doi.org/10.4236/ce.2020.119118>
- Timotheou, S., Miliou, O., Dimitriadis, Y., Sobrino, S. V., Giannoutsou, N., Cachia, R., Monés, A. M., & Ioannou, A. (2022). Impacts of digital technologies on education and factors influencing schools' digital capacity and transformation: A literature review. *Education and Information Technologies*, 28(6), 6695–6726. <https://doi.org/10.1007/s10639-022-11431-8>
- Vukićević, A. M., Mačuzić, I., Djapan, M., Milićević, V., & Shamina, L. (2021). Digital Training and Advanced Learning in Occupational Safety and Health Based on Modern and Affordable Technologies. *Sustainability*, 13(24), 13641. <https://doi.org/10.3390/su132413641>
- Zhu, M., Johnson, M., Dutta, A., Panorkou, N., Samanthula, B., Lal, P., & Wang, W. (2020). Educational simulation design to transform learning in earth and environmental sciences. *2020 IEEE Frontiers in Education Conference (FIE)*, 1–6. <https://doi.org/10.1109/FIE44824.2020.9274198>