International Research Journal of Advanced Engineering and Science
ISSN (Online): 2455-9024

Technology Proficiency and Technology-Based Instructional Practices of TVE Teachers: Their Relationship to Students' Perceived Learning Gains

Cherry Ann P. Orocio[1], Daisy E. Salas[2]
[1]Department of Education, Sibagat National High School of Home Industries, Sibagat, Agusan del Sur-8503
[2] Department of Graduate Studies, North Eastern Mindanao State University, Tandag City, Surigao del Sur, Philippines-8300

Abstract— *This study determined the relationship between TVE teachers' technology proficiency, technology-based instructional practices, and students' perceived learning gains. It also explored the barriers teachers encountered in implementing technology-based instruction and the coping mechanisms they employed. An explanatory sequential mixed-methods research design was employed. The quantitative phase utilized a descriptive-correlational approach involving 50 TVE teachers and 147 Grade 7 students from selected public secondary schools in Sibagat, Agusan del Sur, during School Year 2025–2026. Data were gathered using validated survey questionnaires and analyzed through frequency counts, percentages, weighted mean, standard deviation, Spearman's rho, Pearson's r, and one-way ANOVA. The qualitative phase involved interviews with selected teacher participants, and the data were analyzed using thematic analysis to explain and enrich the quantitative findings. Findings revealed that TVE teachers demonstrated moderate to high levels of technology proficiency and moderately extensive application of technology-based instructional practices. Students reported moderate to high perceived learning gains in conceptual understanding, procedural knowledge, motivation and engagement, work-ready digital competence, and collaboration and problem-solving skills. Results further showed no significant relationship between selected teacher profile variables and technology proficiency. However, significant positive relationships were found between teachers' technology proficiency and technology-based instructional practices, and between technology-based instructional practices and students' perceived learning gains. Qualitative findings identified limited training opportunities, inadequate technological resources, and unstable internet connectivity as major barriers, while self-directed learning, peer collaboration, and adaptability emerged as common coping strategies. Effective technology integration enhances instructional practices and improves student learning experiences. A Technology Integration Enhancement Program is recommended to strengthen teachers' proficiency and support sustainable technology-based instruction in TVE.*

Keywords: *Technology proficiency, technology-based instructional practices, perceived learning gains, TVE teachers, technology integration, mixed-methods research.*

I. INTRODUCTION

In today's technology-driven education system, the use of digital tools is crucial. This is particularly true in Technical-Vocational Education (TVE), where practical skills and hands-on learning matter most. [1]. Recent studies emphasize that meaningful technology integration is driven by teachers' digital competence and their capacity to align technology with sound pedagogy and subject-specific goals. Teacher digital competence frameworks highlight professional and instructional capabilities such as selecting digital resources, designing technology-supported learning activities, and assessing learning with technology [2]. Evidence from vocational contexts similarly indicates that vocational teachers' digital competence is a key condition for effective technology integration and is influenced by both personal and contextual factors [3]. In addition, vocational education literature has proposed extensions of TPACK, such as Technological Pedagogical Vocational Knowledge (TPVK), to account for the distinctive demands of vocational teaching and learning. Research further indicates that teachers' digital competence plays a central role in shaping student outcomes, including academic confidence and engagement, which are often reflected in students' perceived learning gains. [4]

Instructional practices play a central role in shaping student learning outcomes and teachers' professional growth. Research consistently highlights the effectiveness of student-centered, collaborative, and adaptive strategies in junior high school contexts. International evidence suggests that approaches such as active learning, peer instruction, and project-based tasks can enhance student engagement, critical thinking, and conceptual understanding [5]. It has been reported that mastery learning supports deeper understanding, reduces learning gaps, and enables teachers to respond to diverse learners' needs. When combined with collaborative and interactive strategies, mastery-oriented instruction may foster both academic achievement and meaningful classroom interaction. [6] reported that instructional approaches emphasizing active engagement and cooperation enhanced student participation and teacher adaptability in technology-supported environments. Taken together, these studies suggest that instructional practices do not merely shape student learning; they may also create classroom conditions that support teachers' willingness and readiness to integrate digital tools effectively.[7] Professional development is frequently cited as a key support for competence-building.[7] reported that participation in professional development is associated with improved competence and enhanced ability to implement instructional practices in the classroom. However, constraints remain a persistent concern. [8] highlighted that workload and institutional barriers, such as limited time, lack of support, or insufficient resources, can hinder effective technology adoption and reduce consistent integration in practice.

Cherry Ann P. Orocio, Daisy E. Salas, "Technology Proficiency and Technology-Based Instructional Practices of TVE Teachers: Their Relationship to Students' Perceived Learning Gain," *International Research Journal of Advanced Engineering and Science*, Volume 11, Issue 2, pp. 117-121, 2026.

International Research Journal of Advanced Engineering and Science
ISSN (Online): 2455-9024

II. Methodology

This section presents the research design, respondents, instruments, and statistical methods used to examine the relationships among the study's key variables.

A. Research Design

This study employed an explanatory sequential mixed-methods research design, in which quantitative data were collected and analyzed first, followed by qualitative data collection to explain and deepen the quantitative results.

B. Respondents

The study respondents comprised 50 TVE Teachers and 157 Grade 7 Students, selected through purposive sampling. And for the qualitative phase, 8 key informants were selected using purposive sampling informed by the results of the quantitative survey

C. Instrumentation

For the quantitative phase, a structured survey questionnaire was used. The survey was developed and adapted from existing validated measures related to teacher digital competence, technology integration practices, and student-perceived learning outcomes.

For the qualitative phase, a semi-structured interview guide was used to obtain in-depth explanations from selected TVE teachers. Interview questions explored participants' experiences, perceptions, enabling conditions, and challenges related to technology use in TVE instruction

D. Statistical Treatment

The data were analyzed using the weighted mean to determine the levels of the variables, the Pearson's correlation coefficient (r), and Thematic analysis following familiarization, coding, categorization, and theme development.

III. Results And Discussion

This section presents and discusses the study's findings based on the gathered data, highlighting key results and their implications for the research objectives.

A. Profile of TVE Teachers

This section presents the profile of the TVE teacher-respondents, including academic background, area of specialization, teaching position or rank, length of teaching experience, and training and seminars attended. These variables are important because they provide context for understanding teachers' levels of technology proficiency and the extent to which technology is applied in TVE instruction. The high percentage of teachers holding a bachelor's degree indicates that most respondents satisfy the minimum educational qualifications required for entry into the teaching profession. This finding is consistent with educational workforce studies showing that bachelor's degree attainment remains the standard credential for teacher employment in many educational systems (Darling-Hammond, 2017). The relatively low proportion of teachers with completed master's degrees may suggest that many educators are still pursuing postgraduate studies but face barriers such as financial constraints, heavy workloads, and limited access to graduate education. Research has shown that time constraints, financial costs, and competing professional responsibilities are among the primary factors limiting teachers' participation in advanced degree programs [15].

TABLE 1. Profile of TVE Teachers

	Level	Frequency	Percentage
Academic Background	Bachelors degree	39	78%
	with MA Units	10	20%
	Master's Degree	1	2%
TOTAL		50	100%
Area of Specialization	Field	Frequency	Percentage
	Industrial Arts (IA)	3	6%
	Home Economics (HE)	42	84%
	Agriculture and Fishery Arts (AFA)	3	6%
	Information and Communication Technology (ICT)	2	4%
TOTAL		50	100%
Teaching Position/Rank	Rank	Frequency	Percentage
	Teacher I	31	62%
	Techer II	4	8%
	Teacher III	13	26%
	Master Teacher I	2	4%
TOTAL		50	100%
Length of Teaching Experience	No. of Years	Frequency	Percentage
	0-3 Years	2	4%
	4-7 Years	15	30%
	8-11 Years	9	18%
	12-15 Years	14	28%
	16 years and above	10	20%
TOTAL		50	100%
Trainings Attended	No. of trainings	Frequency	Percentage
	None	20	
	1 to 2	18	36%
	3 to 4	10	20%
	5 and above	2	4%
TOTAL		50	100%
Common technology Resources Available	Gadgets	Frequency	Percentage
	Laptop/ PC	50	100%
	Projector TV	6	12%
	Speakers	12	24%
	Internet/ wifi	47	94%
	Printer	35	70%
	LMS/ online Platform	47	94%

The predominance of Home Economics specialization may be attributed to the greater availability of related teacher education programs and the sustained demand for Home Economics educators in secondary schools. In contrast, the lower representation of ICT teachers may reflect the nationwide shortage of qualified ICT professionals and the specialized technical competencies required in the field [22]. The large proportion of Teacher I respondents suggests that many teachers remain in the early stages of their professional careers or have yet to meet the requirements for promotion to higher ranks. Career progression within the teaching profession is often influenced by educational attainment, professional development, years of service, and performance evaluations [17]. Meanwhile, the limited number of Master Teacher I respondents may be explained by the stringent qualifications, extensive teaching experience, and restricted

Cherry Ann P. Orocio, Daisy E. Salas, "Technology Proficiency and Technology-Based Instructional Practices of TVE Teachers: Their Relationship to Students' Perceived Learning Gain," *International Research Journal of Advanced Engineering and Science*, Volume 11, Issue 2, pp. 117-121, 2026.

International Research Journal of Advanced Engineering and Science
ISSN (Online): 2455-9024

availability of higher-ranking positions. This distribution indicates that most respondents possess a moderate level of teaching experience, which has been associated with improved instructional effectiveness and classroom management capabilities [19]. The relatively small percentage of teachers with only 0–3 years of experience may further indicate workforce stability and teacher retention within the participating schools. Teacher retention has been linked to institutional support, job satisfaction, and positive working conditions that encourage educators to remain in the profession [18]. Furthermore, the findings reveal limited participation in professional development activities, suggesting that many teachers may have insufficient opportunities for continuous learning and skills enhancement. Previous studies have identified inadequate funding, scheduling conflicts, and limited access to training programs as common barriers to teacher professional development [20]. The very low percentage of teachers who attended numerous training sessions indicates that only a small number have benefited from sustained professional growth opportunities, potentially affecting their capacity to stay up to date with emerging pedagogical and technological trends. Finally, the universal availability of laptops or personal computers among respondents highlights the increasing integration of digital technologies in teaching and learning. The high availability of Internet/Wi-Fi access and Learning Management Systems (LMSs) further demonstrates strong institutional support for technology-enhanced instruction, which has been shown to facilitate effective teaching, access to resources, and flexible learning environments [21].

In contrast, Projector TV (12%) was the least available resource. The limited availability of projectors may be attributed to budget constraints, inadequate infrastructure, or unequal distribution of technological resources among schools. [2] emphasized that teacher digital competence is shaped by a broad set of professional, pedagogical, and technological capacities rather than by technical skill alone. [3] Likewise, it was found that both personal and context-related factors influence vocational teachers' digital competence. [9] further explained that the quality of classroom technology integration depends on teachers' perceived utility of technology and the specific instructional context.

B. Level of self-assessed Technology proficiency of TVE teachers in the use of technology for instruction.

TABLE 2. Summary of the Teachers' Level of Technology Proficiency

Indicators	Mean	Adjectival Rating
Technical Operational Skill	3.380	Moderately Proficient
Pedagogical Skill	3.504	Proficient
Troubleshooting Skill	3.056	Moderately Proficient
Digital Content Creation & Curation Skill	3.208	Moderately Proficient
Adaptation to Relevant Technology	3.568	Proficient
Overall Mean	3.343	Moderately Proficient

The results indicate that the respondents have an overall mean of 3.343, described as Moderately Proficient, suggesting that TVE teachers possess an adequate level of technology competency but still have room for improvement in several areas. This finding implies that while teachers are capable of utilizing technology in their instructional practices, they may not yet have fully mastered all technological skills necessary for highly effective technology integration in teaching and learning. Among the indicators, Adaptation to Relevant Technology obtained the highest mean score of 3.568, with an adjectival rating of Proficient. This result suggests that the respondents are generally capable of adjusting to new and emerging technologies relevant to their teaching responsibilities. The high rating may be attributed to the increasing availability of digital tools and online learning platforms, as well as the growing demand for technology integration in education. It also reflects teachers' willingness to learn and utilize technological resources to enhance classroom instruction and meet the evolving needs of learners.[13] Similarly, Pedagogical Skill received a mean score of 3.504, also interpreted as Proficient. This indicates that teachers are confident in incorporating technology into their teaching strategies and instructional methods. The result suggests that respondents understand how technology can support learning objectives, facilitate student engagement, and improve instructional delivery. Their proficiency in this area may have been developed through teaching experience, self-directed learning, and exposure to technology-enhanced educational practices. On the other hand, Troubleshooting Skill recorded the lowest mean score of 3.056, interpreted as Moderately Proficient. This finding indicates that teachers experience some difficulties in diagnosing and resolving technical problems that may arise during technology use. The lower rating may be attributed to limited technical training, insufficient hands-on experience with technology maintenance, or a lack of specialized support when technological issues occur. As a result, teachers may rely on colleagues, technical staff, or external assistance to address technological challenges. Likewise, Digital Content Creation and Curation Skill obtained a mean score of 3.208, while Technical Operational Skill received a mean score of 3.380, both interpreted as Moderately Proficient. These results suggest that although teachers can operate technological tools and create or manage digital instructional materials, their skills may not yet be advanced enough to fully realize the potential of educational technologies. This may be due to limited professional development opportunities, lack of advanced training, or insufficient exposure to specialized digital content creation tools.[2] explained that teacher digital competence includes technical, pedagogical, ethical, and professional dimensions of technology use. [3] Found that vocational teachers' digital competence involves both individual capability and contextual support for technology integration. [4]

C. *Extent of Application of Technology-Based Instructional Practices of TVE Teachers*

TABLE 3. Summary of the Teachers' Technology-Based Instructional Practices

Indicators	Mean	Adjectival rating
Technology-enhanced demonstration	3.088	Moderately Practiced
Use of technology for student practice	2.936	Moderately Practiced
Facilitation of a technology-based project	3.072	Moderately Practiced
Use of real-world contextualization	3.004	Moderately Practiced
Proportion of Technology used in class	2.992	Moderately Practiced
Overall Mean	3.018	Moderately Practiced

Cherry Ann P. Orocio, Daisy E. Salas, "Technology Proficiency and Technology-Based Instructional Practices of TVE Teachers: Their Relationship to Students' Perceived Learning Gain," *International Research Journal of Advanced Engineering and Science*, Volume 11, Issue 2, pp. 117-121, 2026.

The results indicate that the respondents have an overall mean of 3.018, interpreted as Moderately Practiced, suggesting that technology integration is present in their instructional practices but is not yet implemented extensively or consistently. This finding implies that while teachers recognize the importance of incorporating technology into teaching and learning, its utilization remains at a moderate level, possibly due to limitations in resources, training, technical skills, or institutional support.[12] Among the indicators, Technology-Enhanced Demonstration obtained the highest mean score of 3.088, with an adjectival rating of Moderately Practiced. This result suggests that teachers moderately use technological tools, such as presentations, videos, simulations, and multimedia resources, when demonstrating concepts and skills in the classroom. The relatively higher score may be attributed to the accessibility of laptops, internet connectivity, and online resources that support instructional demonstrations. However, the rating also indicates that technology-enhanced demonstrations are not yet fully maximized in classroom instruction. Similarly, Facilitation of Technology-Based Projects recorded a mean score of 3.072, while Use of Real-World Contextualization obtained a mean score of 3.004, both interpreted as Moderately Practiced. These findings suggest that teachers occasionally incorporate technology into project-based learning activities and use technological resources to connect lessons with real-life situations. However, the moderate ratings indicate that such practices may not be consistently implemented across all learning activities. Factors such as limited access to specialized equipment, insufficient training, or time constraints may influence the extent of technology integration in these areas. The indicator Proportion of Technology Used in Class obtained a mean score of 2.992, which is also interpreted as Moderately Practiced. This finding suggests that technology is utilized in classroom instruction to a moderate extent but may not be fully embedded in daily teaching practices. Teachers may still rely on traditional teaching methods alongside technological tools, resulting in a balanced but not technology-centered instructional approach.[12]

The lowest mean score, 2.936, was obtained by Use of Technology for Student Practice, which was likewise rated as Moderately Practiced. This result indicates that students have limited opportunities to engage directly with technology during practice activities, exercises, or skill-development tasks. The lower rating may be attributed to insufficient technological devices, internet connectivity issues, limited classroom resources, or teachers' lack of confidence in managing technology-based student activities. As a result, technology may be used more frequently for teacher-led instruction than for student-centered learning experiences.

[9] stressed that technology integration varies according to teachers' beliefs about the usefulness of technology in specific classroom contexts. [10]

Explained that technology integration practices may be understood by examining the actions and roles of teachers and students when digital tools are used. [11] also reported that technology-supported instruction can enhance teaching practices, make learning more interactive, and increase learner motivation when applied meaningfully.

IV. Conclusion

Based on the findings of the study, the following conclusions were drawn:

The findings indicate that TVE teachers possess functional but still developing technological competence, enabling them to use technology in instruction but not yet at a level that ensures consistent, confident, and transformative classroom integration. Teachers demonstrated strengths in using pedagogical technology and adapting to relevant digital tools; however, limitations in troubleshooting and digital content creation constrain their ability to maximize technology-enhanced learning experiences. Technology integration was evident in classrooms, though it remained largely teacher-centered, emphasizing content delivery and demonstrations over student-centered activities that promote collaboration, hands-on practice, and active engagement. While students perceived technology-based instruction as beneficial for improving digital competence and conceptual understanding, its influence on procedural knowledge and practical task performance was comparatively weaker.

Furthermore, teacher profile characteristics generally did not significantly influence technology proficiency, suggesting that competence is shaped more by actual experience, exposure, and institutional support than by demographic factors. The study revealed that technology proficiency alone does not guarantee effective classroom integration; rather, the meaningful application of technology in instruction is the key factor associated with improved student learning outcomes. Moderate levels of technology integration were largely influenced by contextual barriers, including limited resources, insufficient training, unreliable internet connectivity, heavy workloads, and technical challenges. Nevertheless, teachers demonstrated resilience through adaptive strategies such as peer collaboration, self-directed learning, instructional adjustments, and backup planning, indicating that stronger institutional support, targeted professional development, and improved technological resources can further advance technology integration toward more effective, consistent, and learner-centered TVE instruction.

V. Recommendations

Based on the study's findings, it is recommended that TVE teachers further enhance their competencies in troubleshooting, digital content creation, and learner-centered technology integration by providing students with more opportunities to engage with digital tools during practical activities, projects, and performance-based tasks. School administrators and instructional leaders should strengthen support mechanisms through continuous professional development, coaching, mentoring, classroom assistance, and improved access to technological resources, including projectors, internet connectivity, and digital learning platforms. Likewise, DepEd and educational planners should implement sustained, hands-on, and context-specific training

Cherry Ann P. Orocio, Daisy E. Salas, "Technology Proficiency and Technology-Based Instructional Practices of TVE Teachers: Their Relationship to Students' Perceived Learning Gain," *International Research Journal of Advanced Engineering and Science*, Volume 11, Issue 2, pp. 117-121, 2026.

programs that emphasize the practical application of technology in TVE instruction while addressing resource-related challenges. Future studies may expand the investigation across different schools, grade levels, and vocational specializations and incorporate classroom observations, intervention designs, and objective performance measures to further examine the impact of technology integration on students' actual learning outcomes and skill development.

ACKNOWLEDGMENT

The researcher would like to express sincere gratitude to the author's family for their support in making this study possible. Above all, to God for strength and inspiration throughout this journey.

REFERENCES

[1] Althubyani, A. R. (2024). Digital competence of teachers and the factors affecting their competence level: A nationwide mixed-methods study. Sustainability, 16(7), 2796. https://doi.org/10.3390/su16072796Akram,

[2] Falloon, G. (2020). From digital literacy to digital competence: The teacher digital competency (TDC) framework. Educational Technology Research and Development, 68, 2449–2472. https://doi.org/10.1007/s11423-020-09767-4

[3] Cattaneo, A. A. P., Antonietti, C., & Rauseo, M. (2022). How digitalised are vocational teachers? Assessing digital competence in vocational education and looking at its underlying factors. Computers & Education, 176, 104358. https://doi.org/10.1016/j.compedu.2021.104358

[4] Rahmawati, A., Suryani, N., Akhyar, M., & Sukarmin, S. (2021). Vocational teachers' perspective toward technological pedagogical vocational knowledge. Open Engineering, 11(1), 390–400. https://doi.org/10.1515/eng-2021-0040

[5] Bai, S., Hew, K. F., & Huang, B. (2020). Does gamification improve student learning outcome? Evidence from a meta-analysis and synthesis of qualitative data in educational contexts. Educational Research Review, 30, 100322. https://doi.org/10.1016/j.edurev.2020.100322

[6] Verana, N. J. A., Wales, C. C., Parado, P. P., Peteros, E. D., & Santos, M. S. M. D. (2025). Cooperative learning, mathematical achievement, and student affect: A study on Grade 8 students in Philippine schools. British Journal of Teacher Education and Pedagogy, 4(4), 13–27.

[7] Yoon, I., & Goddard, R. D. (2023). Professional development quality and instructional effectiveness: Testing the mediating role of teacher self-efficacy beliefs. Professional Development in Education, 1–15. https://doi.org/10.1080/19415257.2023.2264309

[8] Chen, C. H., Fei, H. Y., & Tsai, C. C. (2025). Hierarchical analysis of in-service teachers' barriers to technology-integrated instruction: A review of 2000–2024 publications. Computers & Education, 228, 105509. https://doi.org/10.1016/j.compedu.2025.105509

[9] Backfisch, I., Lachner, A., Hische, C., Loose, F., & Scheiter, K. (2020). Professional knowledge or motivation? Investigating the role of teachers' expertise on the quality of technology-enhanced lesson plans. Learning and Instruction, 66, 101300. https://doi.org/10.1016/j.learninstruc.2019.101300

[10] Blundell, C. N., Mukherjee, M., & Nykvist, S. (2022). A scoping review of the application of the SAMR model in research. Computers and Education Open, 3, 100093. https://doi.org/10.1016/j.caeo.2022.100093

[11] Akram, H., Abdelrady, A. H., Al-Adwan, A. S., & Ramzan, M. (2022). Teachers' perceptions of technology integration in teaching–learning practices: A systematic review. Frontiers in Psychology, 13, Article 920317. https://doi.org/10.3389/fpsyg.2022.920317

[12] Instefjord, E., & Munthe, E. (2024). The importance of context in teacher educators' professional digital competence. Teachers and Teaching, 30(4), 400–416. https://doi.org/10.1080/13540602.2024.2320155

[13] Antonietti, C., Cattaneo, A. A. P., & Amenduni, M. (2022). Can teachers' digital competence influence technology acceptance in vocational education? Computers in Human Behavior, 132, 107266. https://doi.org/10.1016/j.chb.2022.107266

[14] Department of Education. (2024). Revised career progression system for public school teachers. Department of Education. https://www.deped.gov.ph

[15] Bautista, A., & Ortega-Ruiz, R. (2015). Teacher professional development: International perspectives and approaches. *Psychology, Society & Education, 7*(3), 240–251.

[16] Darling-Hammond, L. (2017). Teacher education around the world: What can we learn from international practice? *European Journal of Teacher Education, 40*(3), 291–309.

[17] Department of Education (DepEd). (2020). *Career progression system for public school teachers*. Department of Education, Philippines.

[18] Ingersoll, R. M., Merrill, L., Stuckey, D., & Collins, G. (2018). *Seven trends: The transformation of the teaching force*. Consortium for Policy Research in Education, University of Pennsylvania.

[19] Kini, T., & Podolsky, A. (2016). Does teaching experience increase teacher effectiveness? A review of the research. *Learning Policy Institute*, 1–44.

[20] OECD. (2019). TALIS 2018 Results (Volume I): Teachers and school leaders as lifelong learners. OECD Publishing.

[21] Trust, T., & Whalen, J. (2020). Should teachers be trained in emergency remote teaching? Lessons learned from the COVID-19 pandemic. *Journal of Technology and Teacher Education, 28*(2), 189–199.

[22] UNESCO. (2023). Global education monitoring report 2023: Technology in education—A tool on whose terms? UNESCO Publishing.