JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

LEARNERS' UTILIZATION OF ICT AND ITS RELATIONSHIP TO LEARNING PERFORMANCE IN TLE – FAMILY AND CONSUMER SCIENCE

Ma. Jonhafer A. Erguiza, MAVEd
Teacher
Department of Education – Schools Division of Cebu City
Bulacao National High School
Cebu City, Philippines
Email: ma.erguiza@deped.gov.ph

ABSTRACT

This study examined learners' use of Information and Communication Technology (ICT) and its relationship with learning performance in Technology and Livelihood Education (TLE) at Bulacao National High School. It employed a quantitative descriptive-correlational research design, supplemented by learners' open-ended responses, to provide contextual explanations of their digital learning experiences. Data were collected through a researcher-developed questionnaire and official TLE performance records. Findings showed that learners used ICT to a great extent for understanding lessons, searching for information, preparing written and digital outputs, documenting performance tasks, and communicating with teachers and classmates. Learners also reported favorable home digital access, responsible ICT practices, and positive perceptions of technology-supported TLE learning. Their Performance Tasks were rated Very Satisfactory, whereas their Written Outputs were rated Fairly Satisfactory, resulting in a Satisfactory overall TLE performance. The findings indicated that learners demonstrated stronger practical and hands-on competencies than written academic skills. However, ICT utilization was not significantly related to learners' Written Outputs or Performance Tasks, indicating that the extent of technology use alone did not determine learning achievement. Open-ended responses identified unstable internet connectivity, limited device availability, technical difficulties, and insufficient teacher support as barriers to effective ICT integration. The study concluded that ICT becomes more educationally meaningful when its use is purposeful, accessible, responsible, guided by teachers, and aligned with TLE competencies and assessment requirements. Consequently, an ICT-integrated instructional intervention plan was proposed to improve written performance, sustain practical competence, strengthen digital literacy, address access barriers, and promote structured, teacher-guided ICT integration and feedback in TLE instruction.

Keywords: *ICT utilization, Technology and Livelihood Education, learning performance, teacher guidance, digital literacy, descriptive-correlational design, Grade 10, Bulacao National High School, Cebu City*

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

INTRODUCTION

Background of the Study

Information and Communication Technology (ICT) has become an important part of modern education because it gives learners access to information, digital resources, communication tools, and interactive learning platforms (Fraillon et al., 2025). In the Philippines, ICT is seen as a support for improving teaching and learning, especially as schools respond to the demands of 21st-century education (Department of Education, 2024). However, despite its benefits, challenges such as poor internet connection, lack of devices, and unequal access to technology continue to affect learners' use of ICT (DepEd, 2023; Philippine Statistics Authority [PSA], 2025; van Dijk, 2020; World Bank, 2025).

Technology and Livelihood Education (TLE) is a subject that develops learners' practical knowledge, life skills, work values, and competencies in Home Economics, Industrial Arts, Agri-Fishery Arts, Entrepreneurship, and ICT (DepEd, 2016). Since TLE combines theory and hands-on activities, ICT can help learners understand lessons better, search for information, watch demonstrations, create outputs, and complete performance-based tasks. Studies show that ICT integration in TLE and vocational education can improve learner engagement, practical skills, collaboration, and learning outcomes when used properly (Rodriguez & Habla, 2024; Kilag et al., 2024; Abayari, 2025).

Globally, education systems are increasingly using ICT not only for communication and administration but also to improve learning. Digital tools such as simulations, multimedia resources, and online platforms help make learning more interactive, practical, and learner-centered (UNESCO, 2023; Mishra & Koehler, 2006). In technical and vocational education, ICT supports hands-on learning, repeated practice, problem-solving, and workforce readiness (Kaysi, 2025; Yindeemak et al., 2026).

Across Asia, many countries are also strengthening ICT integration to prepare learners for a digital workforce (Asian Development Bank [ADB], 2016; So, 2016). However, access to devices does not automatically lead to better learning. What matters more is how often learners use technology, why they use it, and whether it is used for meaningful academic tasks rather than only for entertainment or social media (Organisation for Economic Co-operation and Development [OECD], 2023; So, 2016).

In the Philippines, the MATATAG Curriculum highlights the importance of foundational skills, digital literacy, and ICT in TLE (DepEd, 2024). However, many schools still face problems such as unstable internet connections, limited equipment, and unequal access to digital tools (DepEd, 2023; PSA, 2025; World Bank, 2025). These challenges may affect how learners use ICT and how ICT contributes to their actual learning performance.

At Bulacao National High School in the Division of Cebu City, these issues are seen in everyday TLE learning. Many learners are comfortable using mobile phones and social media, but they may still struggle to apply ICT to technical TLE tasks such as spreadsheet budgeting, drafting, computer servicing, or project preparation. Limited laboratory time, shared devices, and large class sizes may also affect learners' opportunities to use technology for performance-based activities.

Although many studies discuss teachers' ICT skills, school readiness, and infrastructure, fewer studies focus on learners' actual ICT use and how it relates to their TLE performance. This creates a gap in understanding whether learners' use of ICT for research, practice, collaboration, and project completion is connected to their written outputs and performance tasks.

Thus, this study is important because it seeks to determine the relationship between learners' ICT utilization and their learning performance in TLE. The findings may help teachers, school administrators, and education planners design more appropriate ICT-based interventions that respond to learners' real needs and improve their practical and academic performance.

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

Review of Related Literature

ICT in Learning and in Technology and Livelihood Education

ICT has changed the way learners access information and learn. Today, learners are no longer limited to textbooks and classroom discussions because they can use online resources, videos, learning platforms, and communication tools to support both independent and collaborative learning (UNESCO, 2023a; UNESCO, 2023b). In the Philippines, ICT is also recognized as a tool for improving learning delivery, developing digital literacy, and preparing learners for the modern workforce (Espinosa et al., 2023; Department of Education [DepEd], 2022).

In Technology and Livelihood Education (TLE), ICT is especially useful because the subject focuses on practical, technical, entrepreneurial, and work-related skills. Learners can use ICT to search for information, watch demonstrations, create presentations, communicate with teachers and classmates, and accomplish written or performance-based outputs. Since TLE promotes experiential and hands-on learning, digital tools can help learners better understand procedures, practice skills, and improve their outputs (DepEd, 2016; Rodriguez & Habla, 2024). Studies also show that ICT integration in TLE can improve learner engagement, practical skills, and conceptual understanding (Kilag et al., 2024; Abayari, 2025).

However, learners' use of ICT is affected by several factors, such as access to gadgets, internet connectivity, digital skills, and responsible technology use. In the Philippines, the digital divide remains a major challenge, especially for learners with limited devices or unstable internet access (Philippine Statistics Authority [PSA], 2025; World Bank, 2025). These barriers may affect how learners use ICT for research, communication, digital outputs, and performance tasks.

Because of this, it is important to determine whether learners' use of ICT is related to their performance in TLE. Understanding this relationship can help teachers, school administrators, and curriculum planners develop better support systems and ICT-based interventions for learners. Therefore, this study seeks to examine the use of ICT among TLE learners and determine its relationship to their learning performance.

Theoretical Foundations

This study is anchored on the Technology Acceptance Model (TAM) by Davis. The Technology Acceptance Model explains that a person's acceptance and use of technology are influenced mainly by two beliefs: perceived usefulness, or the belief that using a system improves performance, and perceived ease of use, or the belief that using a system requires minimal effort (Davis, 1989). In the context of this study, learners are more likely to use ICT if they believe that it helps them understand lessons, accomplish school tasks, and improve their performance in TLE. This aligns with TAM's view that users' perceptions of usefulness and ease of use shape their intention to use technology and their actual technology use (Davis, 1989). A study on ICT integration in education used TAM to explain how educators' attitudes, perceived usefulness, and perceived ease of use influence technology adoption and instructional use of web-based and digital tools (Ibrahim & Shiring, 2022). Similarly, research on smartphone technology in the classroom applied an extended TAM and showed that learners' behavioral intention to use technology is influenced by factors such as perceived usefulness, perceived ease of use, attitude, and subjective norms (Fuchs, 2022). Therefore, TAM is appropriate for this study because it helps explain how learners' beliefs about the usefulness and ease of ICT use may affect their willingness to use digital tools and how such use may relate to their learning performance in TLE.

This theory is appropriate for the present study because it focuses on learners' use of ICT. If learners find ICT useful and easy to use, they may use it more often for academic purposes such as research, communication, project preparation, and performance tasks. This may then relate to their learning performance in Technology and Livelihood Education.

The variables of this study are theoretically grounded in three distinct clusters of educational paradigms. The independent variable of the study is grounded in the Unified Theory of Acceptance and Use of Technology (UTAUT) and Connectivism. The Unified Theory of Acceptance and Use of Technology (UTAUT), formulated

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

by Venkatesh, Morris, Davis, and Davis (2003), explains that behavioral intention and actual technology use are shaped by four major determinants: performance expectancy, effort expectancy, social influence, and facilitating conditions (Venkatesh et al., 2003). In this study, UTAUT explains learners' frequency of ICT access and the types of ICT tools they use based on whether they perceive these tools as useful, easy to use, socially supported, and accessible for completing academic responsibilities in TLE (Venkatesh et al., 2003). For example, learners may be more likely to use search engines, video demonstrations, messaging applications, learning platforms, or productivity tools when they believe these technologies help them accomplish school tasks, improve learning performance, and support practical outputs.

In addition, the study is also anchored in Connectivism, introduced by Siemens (2005) as a learning theory for the digital age. Connectivism asserts that learning occurs through the creation of networks and the connection of different information sources, people, tools, and digital environments (Siemens, 2005). This theory supports the purpose of ICT utilization in TLE because modern learners do not rely solely on classroom instruction; instead, they use digital resources to search for information, collaborate with peers, communicate with teachers, and construct knowledge beyond traditional classroom boundaries (Siemens, 2005). Through Connectivism, ICT use may be understood as a way for learners to self-navigate learning, access multiple sources of knowledge, and participate in network-based learning experiences that strengthen practical and technical competencies.

Digital Divide Theory, advanced by Norris (2001), conceptualizes the digital divide as a multi-layered issue involving the global divide, the social divide, and the democratic divide. Norris explains that the global divide refers to unequal access between industrialized and developing societies, the social divide refers to inequalities between rich and poor within nations, and the democratic divide refers to differences between those who use the internet for participation and those who do not (Norris, 2001). In this study, Digital Divide Theory directly underpins the Home Digital Access, recognizing that unequal access to devices, internet connectivity, and digital resources can affect students' capacity to use technology effectively for schoolwork. Structural inequalities in hardware and connectivity may therefore influence how often learners access ICT, what tools they can use, and how productively they can apply technology in their academic tasks (Norris, 2001).

Situated Learning Theory, developed by Lave and Wenger (1991), argues that learning is inherently social and is embedded in authentic contexts and communities of practice. According to this theory, learners develop knowledge and skills by participating in the practices of a community, gradually moving from peripheral participation toward fuller participation as they gain competence (Lave & Wenger, 1991). This theory justifies the inclusion of the TLE component/sector as a supporting and contextual variable because each specialization creates a distinct learning environment or community of practice. For instance, a digital-heavy strand such as ICT may naturally expose learners to more frequent technology use, while more tactile and object-centered strands such as Industrial Arts, Home Economics, now Family and Consumer Science, or Agriculture may require different forms of technology adoption depending on tools, tasks, and performance outputs. Thus, the specialization strand may influence how learners adopt, use, and benefit from ICT in their TLE learning experiences (Lave & Wenger, 1991).

Experiential Learning Theory (ELT), developed by Kolb (1984), states that learning is a continuous process in which knowledge is created through the transformation of experience. Kolb's work emphasizes that learning involves a cycle of concrete experience, reflective observation, abstract conceptualization, and active experimentation (Kolb, 1984). In this study, ELT provides a direct foundation for evaluating Performance Tasks in TLE, since TLE requires learners to apply knowledge through hands-on, practical, and vocational activities. ICT tools such as digital simulations, instructional videos, tutorials, and interactive demonstrations may enhance learners' concrete experiences and support active experimentation by allowing them to observe procedures, practice skills, and refine outputs before or during actual performance tasks (Kolb, 1984).

Cognitive Load Theory, introduced by Sweller (1988), explains how the human brain processes information through limited working memory and how instructional design can either support or hinder learning. Sweller argued that conventional problem-solving activities may impose heavy cognitive demands on learners, reducing

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

the mental capacity available for schema acquisition and long-term learning (Sweller, 1988). In this study, Cognitive Load Theory anchors the assessment of Written Outputs, as structured ICT use may help reduce unnecessary or extraneous cognitive load through organized visual aids, guided examples, video demonstrations, templates, and digital references. At the same time, properly designed digital learning materials may increase germane cognitive load by helping learners focus on essential concepts, procedures, and relationships that support conceptual retention and academic performance in TLE (Sweller, 1988).

Conceptual Framework

The variables of the study and their theoretical and legal anchors are presented in Figure 1.

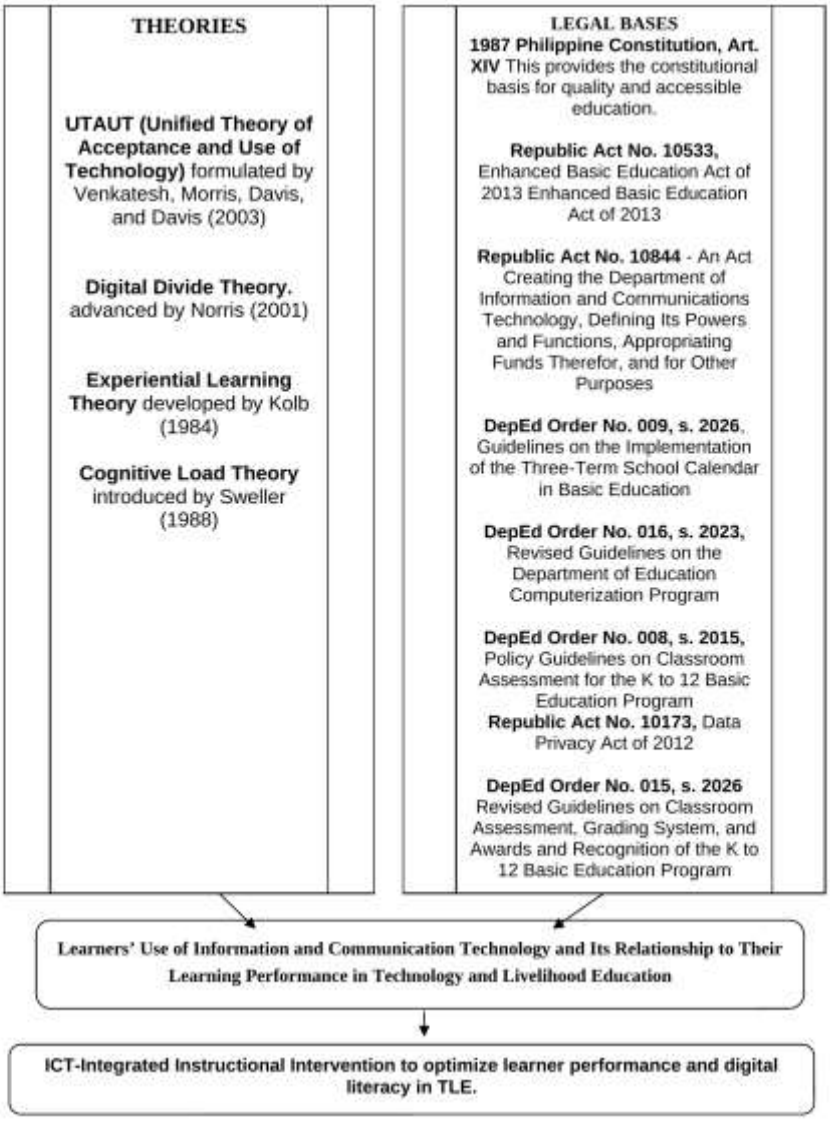
The independent variable focuses entirely on user behavior rather than institutional supply. It categorizes how students take agency over their technology use through three indicators. Frequency of Access refers to how often learners use digital tools for their schoolwork (daily, weekly, or only during formal laboratory periods). Purpose of Utilization refers to the cognitive intent behind technology use, whether passive (searching for a definition), interactive (watching a procedural YouTube video on food preservation), or creative (using Canva to design a floor plan). Types of ICT Tools Deployed refers to the specific hardware and software landscape that learners use, ranging from basic smartphones and social media messaging groups to specialized desktop applications (such as spreadsheets for accounting or CAD software for technical drafting).

The dependent variable reflects student achievement as standardized by the Department of Education's assessment protocols and is divided into the two core grading components. Written Outputs measure the cognitive domain, evaluating learners' understanding of TLE theories, safety protocols, and conceptual knowledge through quizzes, long examinations, and unit tests. Performance Tasks measure the psychomotor and affective domains; they are the heart of TLE, evaluating how well students execute actual hands-on skills for which ICT may serve as a supporting framework. To avoid oversimplifying student realities, two supporting variables were also considered. Home Digital Access and TLE sector or component exposure served as contextual variables that provided additional information about the conditions surrounding learners' ICT utilization. These variables were not statistically tested as moderators or mediators in the present study.

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

Figure 1. The Theoretical Framework of the Study



Legal and Regulatory Context

The legal foundation of this study is anchored on national laws, policies, and Department of Education issuances that support quality education, technology integration, digital literacy, skills development, learner assessment, and data privacy. Since this study examines the relationship between learners' use of Information and Communication Technology (ICT) and their learning performance in Technology and Livelihood Education (TLE), its legal basis strengthens the relevance of ICT-supported instruction and performance-based learning in the Philippine basic education system. The study specifically focuses on learners' ICT use in terms of frequency of access, purpose of utilization, and types of ICT tools deployed, and relates these to TLE written outputs and performance tasks at Bulacao National High School.

The 1987 Philippine Constitution, Article XIV, Section 1, provides that the State shall protect and promote the right of all citizens to quality education at all levels and shall take appropriate steps to make education accessible to all. Article XIV, Section 2 further mandates the State to establish, maintain, and support a complete, adequate, and integrated system of education relevant to the needs of the people and society. These constitutional provisions support the present study because ICT utilization can help make learning more accessible, relevant, and responsive to the needs of modern learners, especially in a practical and skills-oriented subject such as TLE.

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

This study is also supported by Republic Act No. 10533, otherwise known as the Enhanced Basic Education Act of 2013, which strengthens the Philippine basic education curriculum and aims to develop learners who are equipped with competencies, skills, and values for lifelong learning and employment. The law emphasizes quality education, learner-centered instruction, vocational and technical career opportunities, creativity, critical thinking, productivity, and responsiveness to the needs of learners and communities. This legal mandate aligns with the purpose of TLE, which prepares learners for practical work, livelihood, entrepreneurship, and future employment.

Furthermore, the study is aligned with the MATATAG K to 10 Curriculum for EPP/TLE, which recognizes Technology and Livelihood Education as a learning area that develops practical, technical, entrepreneurial, and life skills among learners. The MATATAG EPP/TLE curriculum includes components such as ICT, Agriculture and Fishery Arts, Family and Consumer Science or Home Economics, and Industrial Arts, which are also reflected in the specialization strands considered in this study. This supports the inclusion of the TLE sector/component as a supporting variable because different areas of specialization may require different forms and levels of ICT use.

The integration of ICT in this study is further supported by Republic Act No. 10844, or the Department of Information and Communications Technology Act of 2015. This law recognizes the vital role of information and communication in nation-building and promotes the use of ICT for improving public services, including education. It also supports digital literacy, ICT expertise, knowledge-building, universal access to ICT services, and the empowerment of disadvantaged groups through technology. These provisions provide a legal foundation for examining learners' access to digital tools, their use of ICT for learning, and how ICT may contribute to their academic and practical performance in TLE.

The study is also grounded in DepEd Order No. 016, s. 2023, or the Revised Guidelines on the Implementation of the Department of Education Computerization Program. This policy aims to provide public schools and DepEd offices with appropriate, quality, and equitable technologies that enhance teaching, learning, governance, operations, programs, and policies in response to the challenges of the modern age. This supports the present study's focus on learners' access to ICT tools, internet connectivity, productivity software, digital learning platforms, and specialized vocational applications used in TLE learning.

The study is further supported by DepEd Order No. 009, s. 2026, or the Guidelines on the Implementation of the Three-Term School Calendar in Basic Education. This issuance provides the policy context for School Year 2026–2027 by organizing basic education into three terms to optimize instructional time, strategically implement school activities, and support learning recovery. In relation to this study, the policy is relevant because the use of ICT in TLE may help teachers and learners maximize longer and more flexible instructional periods through digital learning resources, online research, video demonstrations, collaborative outputs, documentation of performance tasks, and ICT-integrated interventions. It also strengthens the need to examine how learners use ICT to improve written outputs and performance tasks within the revised school calendar structure.

In terms of assessing learners' TLE learning performance, the study is supported by DepEd Order No. 8, s. 2015, or the Policy Guidelines on Classroom Assessment for the K to 12 Basic Education Program. This DepEd policy states that classroom assessment is an integral part of curriculum implementation because it allows teachers to track and measure learners' progress and adjust instruction accordingly. It also identifies assessment components such as written work and performance tasks, which directly align with the dependent variables of the study, namely, learners' Written Output and Performance Task scores.

Finally, because the study involves student respondents, survey responses, and TLE performance records, it is legally guided by Republic Act No. 10173, or the Data Privacy Act of 2012. This law protects individual personal information in information and communication systems in both government and private sectors. It recognizes the importance of privacy while allowing the free flow of information to promote innovation and growth. In this study, the Data Privacy Act supports the use of informed consent, student assent, respondent codes, confidential handling of school records, and secure storage of data, especially since the respondents are learners and may include minors.

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

Taken together, these legal provisions justify the conduct of the study because they emphasize the right to quality and accessible education, the strengthening of basic education, the development of vocational and technical competencies, the integration of ICT in teaching and learning, the use of valid classroom assessment, and the protection of learners' personal information. Thus, the legal basis complements the theoretical anchors of the study by showing that learners' ICT utilization and its relationship to TLE performance are not only theoretically relevant but also legally supported within the Philippine educational system.

Related Literature and Studies

The recent literature strengthens the need to examine learners' actual use of ICT, rather than only the availability of devices or the general readiness of schools. Studies from 2022 to the present show that educational technology can support learning performance when it is purposeful, guided, and aligned with subject-specific tasks. However, the same literature also warns that frequent technology use alone does not automatically improve achievement. This is highly relevant to the present study because TLE requires both conceptual understanding and performance-based skills, and learners may use ICT for research, video demonstrations, communication, project preparation, and digital documentation.

Valverde-Berrocoso, Acevedo-Borrega, and Cerezo-Pizarro (2022) conducted a systematic review of 100 studies on educational technology and student performance. The review found evidence that ICT-enriched practices may improve academic performance, but it also emphasized that results vary depending on pedagogy, subject area, learning context, and the quality of technology integration. This finding supports the present study because it does not assume that ICT use is automatically beneficial; instead, it investigates the relationship between specific dimensions of ICT use and learners' TLE performance.

In a study on smartphone technology in the classroom, Fuchs (2022) used an extended Technology Acceptance Model and reported that learners' behavioral intention to use smartphone technology was influenced by perceived usefulness, perceived ease of use, attitude, and subjective norms. The study is related to the present research because learners are more likely to use ICT in TLE when they believe that digital tools help them understand lessons, accomplish tasks, and communicate productively with teachers and classmates.

Ibrahim and Shiring (2022) examined educators' attitudes, perceived usefulness, and perceived ease of use of instructional and web-based technologies using the Technology Acceptance Model. Their findings showed that technology adoption in education is influenced by users' beliefs and attitudes toward digital tools. Although the study focused on educators, its theoretical implication is useful for the present study because learners' acceptance of ICT may similarly affect how often and how meaningfully they use digital tools for TLE activities.

UNESCO (2023) emphasized that technology in education should be used on learners' and teachers' terms, with attention to equity, relevance, teacher support, safety, and learning value. The report cautioned that technology is not a solution by itself and that its benefits depend on meaningful use, access, and sound pedagogy. This supports the inclusion of home digital access in the present study because access to devices and connectivity may shape learners' opportunities to use ICT for TLE learning.

OECD (2023), in PISA 2022 results, highlighted that digital learning during and after crises revealed both opportunities and inequalities. The report showed that digital resources can support learning continuity, but learners need guidance, appropriate learning environments, and equitable access to benefit from ICT. This finding is relevant to the present study because learners' ICT use in TLE may differ depending on their home access, purpose of utilization, and ability to use tools for academic rather than purely recreational purposes.

Espinosa and colleagues (2023) presented a Philippine case study on technology in education and emphasized that technology integration in the country is affected by infrastructure, teacher capacity, access to devices, connectivity, and policy implementation. Their study provides national context for the present research by showing that ICT use in Philippine schools remains shaped by uneven resources and implementation conditions.

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

Rodriguez and Habla (2024) examined learning continuity in TLE instruction through ICT integration. Their study emphasized the importance of using ICT to sustain instruction, deliver learning materials, communicate with learners, and support flexible learning arrangements in Technology and Livelihood Education. This is directly related to the present study because both focus on how ICT supports TLE learning, particularly in tasks that require research, preparation, collaboration, and output completion. Kilag, Miñoza, Comighud, Amontos, Damos, and Abendan (2024) discussed the integration of technology into livelihood education and emphasized that digital tools can empower teachers and enhance learner engagement when aligned with practical learning goals. Their work supports the present study's argument that ICT may help learners improve TLE outputs when used in ways that strengthen skill development, creativity, communication, and performance-based learning.

Calma (2024) investigated facilitating learning and academic performance of learners in TLE under the K to 12 curriculum. The study found a strong positive relationship between facilitating learning practices and learners' academic performance, and it identified technology utilization, collaboration, and opportunities to showcase practical skills as areas needing improvement. This study is relevant because it shows that TLE performance is connected to instructional support and that technology integration remains an area for strengthening in TLE classrooms.

Espinosa et al. (2025) critically analyzed contextual factors affecting ICT integration in Philippine schools. Using a literature review and qualitative data, the study identified infrastructure development, leadership support, and partnerships as important requirements for successful EdTech implementation. This supports the present study's emphasis on home digital access and school-based support because learners' ICT practices are influenced by broader contextual conditions.

Mbambo and du Plessis (2025) evaluated digital skills among Technical Vocational Education and Training college students and examined their relationship with throughput rate. The study found that many TVET students lacked basic digital skills and that weak digital competence can hinder students' academic work in technology-supported environments. This is relevant to TLE because TLE learners are expected to use productivity tools, online resources, communication applications, and specialized digital tools to complete vocational and practical tasks.

Kaysi (2025) investigated the impact of simulation software on students' learning processes and reported that simulation tools can support learning by allowing students to visualize processes, practice tasks, and engage with content interactively. This finding is useful in TLE because learners may use video demonstrations, simulations, and digital applications to understand procedures before performing hands-on activities.

DepEd (2025) also recognized the need to bridge classroom and digital gaps through public-private partnerships, including school digitalization, electricity support, satellite internet connectivity, tablets for learners, and laptops for teachers. This policy direction strengthens the practical importance of the present study because localized evidence from Bulacao National High School can help identify how learners actually use ICT and what support they need for TLE performance.

The reviewed studies consistently show that ICT can support learning when it is accessible, purposeful, guided, and integrated with meaningful pedagogical activities. International studies emphasize that the effectiveness of technology depends on quality of use, digital competence, and instructional alignment. Philippine studies and policy reports further show that learners' ICT use is affected by infrastructure, connectivity, school support, and unequal access to devices. In relation to the present study, these findings justify the need to measure learners' ICT use according to frequency of access, purpose of utilization, and types of ICT tools deployed, and to determine whether these dimensions are related to written outputs and performance tasks in TLE.

Statement of the Problem

This study aimed to determine the relationship between learners' use of Information and Communication Technology (ICT) and their learning performance in Technology and Livelihood Education (TLE) – Family and

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

Consumer Science at Bulacao National High School (First Shift), Schools Division of Cebu City, during the first term of School Year 2026–2027, as the basis for an integrated instructional intervention plan to optimize student performance and digital literacy in TLE.

Specifically, it sought to answer the following questions:

1. What is the extent of the learners' use of Information and Communication Technology (ICT) in teaching and learning TLE – Family and Consumer Science in terms of:
    1.1 frequency of access;
    1.2 purpose of utilization; and
    1.3 types of ICT tools deployed?
2. What is the learners' perception of the utilization of ICT in TLE – Family and Consumer Science as to:
    2.1 home digital access;
    2.2 responsible use of ICT; and
    2.3 learners' perception of ICT?
3. What is the level of learning performance of the respondents in Technology and Livelihood Education (TLE) – Family and Consumer Science as measured by their:
    3.1 Written Outputs; and
    3.2 Performance Tasks?
4. Is there a significant relationship between the extent of the learners' use of ICT and their learning performance in TLE – Family and Consumer Science?
5. What is the synthesized learners' response to the utilization of ICT in TLE – Family and Consumer Science?
6. Based on the findings, what ICT-integrated instructional intervention plan can be adopted to optimize student performance and digital literacy in TLE – Family and Consumer Science?

Statement of the Null Hypotheses

The following null hypotheses were tested at the 0.05 level of significance:

H_{01}: There was no significant relationship between learners' overall ICT utilization and their Written Outputs in TLE – Family and Consumer Science.

H_{02}: There was no significant relationship between learners' overall ICT utilization and their Performance Tasks in TLE – Family and Consumer Science.

Objectives of the Study

The general objective of this study was to determine the relationship between learners' use of ICT and their learning performance in TLE – Family and Consumer Science at Bulacao National High School as the basis for an integrated instructional intervention plan to optimize student performance and digital literacy in TLE. Specifically, it sought to:

1. determine the extent of learners' use of ICT in TLE – Family and Consumer Science in terms of frequency of access, purpose of utilization, and types of ICT tools deployed;
2. Describe learners' perceptions of the utilization of ICT in terms of home digital access, responsible use of ICT, and perception of ICT use;

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

3. determine the level of learners' learning performance in terms of Written Outputs and Performance Tasks;
4. determine whether a significant relationship exists between the extent of learners' use of ICT and their learning performance;
5. synthesize learners' open-ended responses on the utilization of ICT in TLE – Family and Consumer Science; and
6. propose an ICT-integrated instructional intervention plan based on the findings.

Significance of the Study

This study is significant because it examines the relationship between learners' use of Information and Communication Technology (ICT) and their learning performance in Technology and Livelihood Education (TLE) – Family and Consumer Science. Since TLE is both knowledge-based and performance-based, understanding how learners use ICT for research, communication, technical practice, digital outputs, and performance tasks can provide meaningful insights into how technology supports practical and skills-oriented learning. The findings of this study may benefit the following:

Policymakers. The findings may provide policymakers with localized evidence that can support the formulation, review, and implementation of policies related to ICT integration, digital inclusion, teacher professional development, and technical-vocational education. The study demonstrates that extensive ICT use does not automatically result in improved learning performance. Therefore, educational policies should not focus exclusively on increasing access to devices and internet connectivity but should also emphasize purposeful technology use, teacher guidance, digital literacy, responsible online behavior, instructional alignment, and continuous monitoring. Policymakers may use the findings as a basis for supporting programs that provide equitable access to digital resources, strengthen teachers' ICT competence, improve school infrastructure, and ensure that technology-supported instruction contributes to measurable learning outcomes.

Department of Education and Curriculum Planners. This study may provide useful data for DepEd officials and curriculum planners in strengthening ICT integration within TLE. Since the Revised K to 12 curriculum emphasizes foundational skills, digital literacy, and work-ready competencies, the findings may help determine whether learners' ICT use contributes meaningfully to their actual learning performance. The results may also serve as input in designing more targeted policies, instructional materials, and digital interventions that respond to the realities of learners in public schools.

School Administrators. The findings of this study may assist school administrators in improving school-based ICT programs, laboratory scheduling, equipment allocation, and digital learning support systems. Since the study considers the learners' home digital access and the availability of devices and internet connection, administrators may use the results to identify gaps in ICT access and develop practical solutions such as shared device systems, improved laboratory access, offline digital resources, or partnerships for connectivity and equipment support.

Bulacao National High School. The study may directly benefit Bulacao National High School by providing localized evidence on how learners use ICT and how such use relates to their TLE performance. The findings may help the school develop an ICT-integrated action plan or instructional intervention suited to the needs of its learners. This may support better utilization of computer laboratories, mobile devices, learning platforms, and digital tools for TLE instruction, especially among students with different specialization strands and different levels of digital access.

Community and Industry Partners. The findings may also be useful to community stakeholders and industry partners who support school-based training, livelihood programs, and technical-vocational education. By understanding the role of ICT in developing learners' technical skills, stakeholders may be encouraged to provide assistance through equipment donations, internet connectivity support, digital skills training, or community-based

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

learning opportunities. This can help strengthen the connection between school learning and real-world work readiness.

TLE Teachers. This study may provide TLE teachers with a clearer understanding of how learners use ICT in relation to their academic and performance-based outputs. The findings may help teachers design more appropriate ICT-integrated lessons, activities, demonstrations, and assessments that match the learners' actual access to technology and digital skills. Teachers may also use the results as a basis for creating interventions that support learners who have limited devices, unstable internet access, or low confidence in using digital tools for TLE tasks.

ICT Coordinators. The findings may assist ICT coordinators in identifying the technical and instructional support required by teachers and learners. ICT coordinators may use the results to plan digital-literacy workshops, software demonstrations, technical-assistance activities, equipment maintenance, and computer-laboratory schedules. They may also collaborate with TLE teachers in preparing offline resources, selecting appropriate applications, developing ICT-supported learning materials, and ensuring that digital tools are accessible and aligned with TLE competencies.

Parents and Guardians. This study may help parents and guardians understand the importance of providing guidance and support in learners' use of technology. The findings may encourage parents to monitor how learners use gadgets and internet access at home, ensuring that ICT is used not only for leisure but also for school-related activities. Parents may also become more aware of how home digital access, such as availability of devices and internet connection, can influence learners' academic performance and participation in TLE tasks.

Learners. The results of this study may help learners become more aware of how their ICT habits affect their performance in TLE. By understanding the frequency, purpose, and types of ICT tools they use, learners may be guided to use technology more responsibly, productively, and academically. The findings may help learners recognize that extensive ICT use alone does not guarantee better performance and that technology should be used purposefully in support of research, skill development, project preparation, collaboration, and independent learning.

Future Researchers. This study may serve as a reference for future researchers who wish to conduct similar studies on ICT use, digital divide, TLE performance, learner behavior, and technology integration in basic education. It may also provide a basis for further investigation on other variables such as digital literacy, teacher ICT competence, learners' motivation, school infrastructure, or the effectiveness of specific digital tools in improving technical-vocational learning outcomes.

Overall, this study is significant because it provides evidence on whether learners' self-directed use of ICT contributes to their learning performance in TLE. The results may help ensure that ICT integration is not merely a policy requirement or classroom trend, but a meaningful educational practice that supports digital literacy, practical skills, academic achievement, and future workforce readiness.

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

METHODS

This section presents the research design, research environment, respondents, research instruments, data-gathering procedure, scoring procedure, statistical treatment, ethical considerations, and operational definition of terms used in the study. The methodology was designed to determine the relationship between learners' use of Information and Communication Technology (ICT) and their learning performance in TLE–Family and Consumer Science during the First Term of School Year 2026–2027.

Research Design

The study employed a quantitative descriptive-correlational research design supplemented by learners' open-ended responses. The descriptive component was used to determine the extent of learners' ICT utilization in terms of frequency of access, purpose of utilization, and types of ICT tools deployed. It also described learners' home digital access, responsible ICT use, perceptions of ICT use in TLE, and learning performance based on Written Outputs and Performance Tasks.

The correlational component was used to determine whether a significant relationship existed between learners' overall ICT utilization and their learning performance in TLE. The descriptive-correlational design was appropriate because the study described the variables as they occurred naturally and examined their statistical relationships without manipulating the respondents' learning conditions.

Flow of the Study

The flow of the study was structured around the Input-Process-Output Model, which illustrated the progression from the study inputs and research procedures to the proposed instructional intervention.

The study began by gathering baseline information on the respondents' digital-access profile, ICT utilization, and TLE learning performance. The respondents' survey data were matched with their Written Output and Performance Task records using anonymous learner codes.

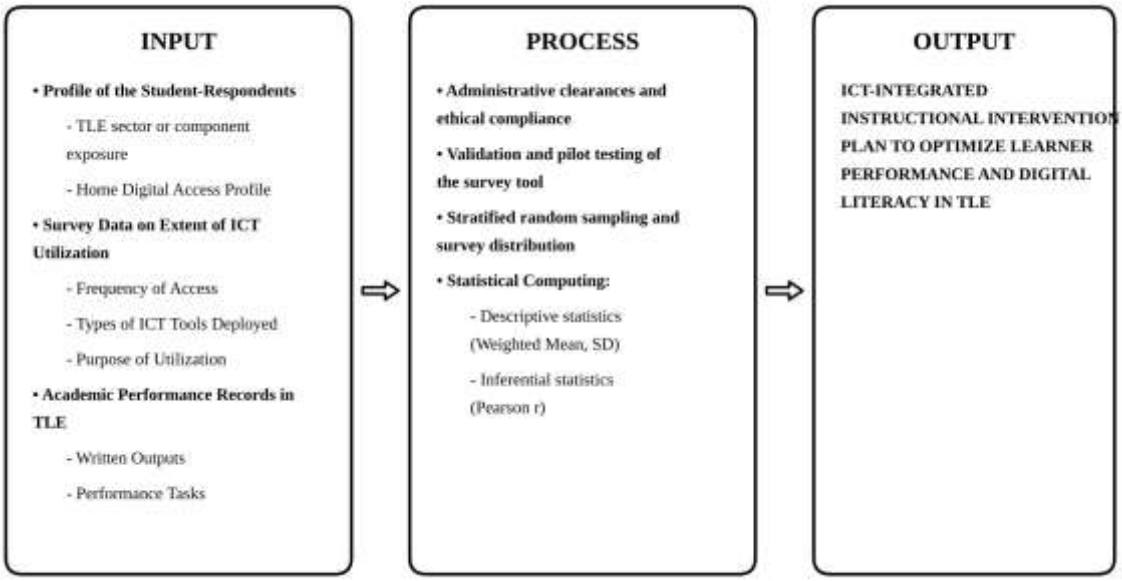
During the process stage, the researcher secured the necessary administrative and ethical clearances, validated and pilot-tested the research instrument, administered the questionnaire, retrieved the performance records, encoded the data, and applied the appropriate statistical procedures. Weighted mean and standard deviation were used to describe ICT utilization and contextual ICT conditions, while mean and standard deviation were used to describe TLE performance. Pearson Product-Moment Correlation was used to determine the relationship between ICT utilization and Written Outputs and Performance Tasks.

During the output stage, the findings, identified performance gaps, learner-reported barriers, and instructional implications were used as the basis for developing the ICT-integrated instructional intervention plan. This final phase bridges theory and practice: the descriptive findings, correlation results, learner-reported barriers, and identified instructional needs informed the design of the plan. The overall flow of the study is shown in Figure 2.

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

Figure 2. The Flow of the Study



Research Environment

The study was conducted at Bulacao National High School, First Shift, under the Schools Division of Cebu City, during School Year 2026–2027. The school is a public secondary school that offers Technology and Livelihood Education – Family and Consumer Science as part of the Junior High School curriculum. Since TLE includes both theoretical and hands-on activities, the school serves as an appropriate research environment for examining how learners' ICT use relates to their written outputs and performance tasks. The study is also relevant to the school context because learners may have varied access to digital devices, internet connectivity, school laboratories, mobile phones, and other ICT tools. These conditions make the school suitable for investigating the role of ICT use in learners' TLE performance. The school operates under the supervision of the Department of Education–Division of Cebu City. It was originally located within the premises of Bulacao Elementary School in Sitio Villa Manga before its transfer to its present site in Cabancalan I, Bulacao, in 2009. Following its relocation, the school expanded its educational services by offering both Day and Night School Programs to address the community's growing educational needs.

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

Figure 3. The Research Environment



Participants of the Study

The respondents of the study were the Grade 10 TLE learners of Bulacao National High School, First Shift, during School Year 2026–2027 and were exposed to different TLE specialization strands, such as: Family and Consumer Science, Industrial Arts, Agri-Fishery Arts, and ICT. They were directly involved in TLE learning activities and were expected to accomplish both written outputs and performance tasks. They were also the primary users of ICT tools for school-related purposes such as research, communication, digital output preparation, project documentation, and performance-based learning activities.

In view of DepEd Order No. 010, s. 2024 and the MATATAG EPP/TLE curriculum, Grade 9 and Grade 10 TLE may be treated as sector-based or component-based exposure rather than full specialization. Hence, if the school implements the MATATAG structure during the actual data gathering, the respondent grouping may be labeled according to the TLE component or sector exposure offered by the school, such as Family and Consumer Science, Industrial Arts, Agri-Fishery Arts, and ICT, rather than as specialization tracks.

Table 1. Distribution of Respondents

Bulacao National High School (First Shift)	Frequency	Percentage of Total Sample
Grade 10 – Isaiah	25	25%
Grade 10 – Jeremiah	25	25%
Grade 10 – Nehemiah	25	25%
Grade 10 – Ezekiel	25	25%
Total	**100**	**100%**

The inclusion criteria are as follows: learner-respondents must be officially enrolled as Grade 10 first shift students of Bulacao National High School during the School Year 2026–2027 and must be willing to participate in the

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

study. Informed consent from their parents or legal guardians and assent from the learners were obtained prior to data collection.

Research Instruments

The study used two main instruments: the Learners' ICT Use Questionnaire and the Documentary Analysis of TLE Learning Performance. These instruments were appropriate because learners differed in device access, connectivity, digital competence, and reasons for using technology.

Learners' ICT Use Questionnaire

The Learners' ICT Use Questionnaire was used to gather direct information regarding learners' ICT utilization in TLE. Since the independent variable focuses on learners' ICT behavior, the questionnaire was suitable for identifying how often learners used ICT, why they used ICT, and what ICT tools they commonly used for school-related tasks.

Specifically, the questionnaire measured the learners' ICT use in terms of:

- frequency of access;
- purpose of utilization; and
- types of ICT tools deployed.

This instrument was necessary because learners may differ in their access to gadgets, internet connection, digital skills, and reasons for using technology. Through the questionnaire, the researcher obtained organized and measurable data on learners' ICT practices, such as using search engines, watching video demonstrations, communicating through group chats, preparing digital outputs, and using productivity tools or vocational applications. It also determined the learners' home digital access, including device availability and internet availability, which may influence their ability to use ICT for TLE learning.

The questionnaire allowed data to be collected systematically from a relatively large number of respondents. Since the study was quantitative in nature, the responses were scored, tabulated, and analyzed using statistical tools such as the weighted mean and correlation analysis. Part VI of the questionnaire consisted of open-ended questions whose responses were synthesized to provide contextual explanations of learners' digital learning experiences. The complete questionnaire is presented in Appendix A.

Documentary Analysis of TLE Learning Performance

The Documentary Analysis of TLE Learning Performance was used because the dependent variable of the study is the learners' actual performance in TLE in the first term of School Year 2026–2027. Instead of relying only on learners' self-reported academic performance, the researcher used official school records or class records to obtain more objective and reliable data. This instrument gathered learners' performance data in terms of Written Outputs and Performance Tasks.

Written outputs reflected the learners' conceptual understanding of TLE lessons, including theories, procedures, safety rules, and technical knowledge. Performance tasks, on the other hand, reflected the learners' practical skills, application of concepts, and ability to produce actual outputs or demonstrate competencies. These two components were important because TLE is both a cognitive and a performance-based subject. Documentary analysis was appropriate because the scores had already been recorded by the teachers as part of regular classroom assessment. Using these official records helped ensure that the data on learning performance were accurate, verifiable, and aligned with the school's grading system. It also reduced bias because the learning performance data did not depend on the learners' personal opinions or estimates of their own grades.

Both instruments were needed because they measured different but related aspects of the study. The questionnaire measured the learners' use of ICT, while the documentary analysis measured their learning performance in TLE. In other words, the questionnaire answered the question, "How do learners use ICT in TLE?" while the documentary analysis answered the question, "How well do learners perform in TLE?" Together, the instruments

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

provided the data needed to determine whether learners' overall ICT utilization was significantly related to their Written Outputs and Performance Tasks.

Validation and Reliability of the Instrument

The questionnaire was evaluated by experts with relevant backgrounds in TLE, ICT, educational research, school administration, and curriculum development. The validators assessed the instrument in terms of clarity, relevance, alignment with the research questions, appropriateness of language, adequacy of indicators, and suitability of the response scale. Comments and suggestions from the validators were incorporated before the final administration of the instrument.

Data-Gathering Procedure

The conduct of the study followed five phases: pre-implementation, implementation, data retrieval, post-implementation, and action planning.

During the pre-implementation phase, the researcher drafted the research proposal, constructed the questionnaire, secured panel approval, and submitted the instrument for content validation. The validators' recommendations were incorporated into the final questionnaire. Pilot testing was then conducted among learners who were not included in the main study.

During the implementation phase, the researcher secured the necessary administrative permissions from the concerned education authorities and school administration. Parent or guardian consent and learner assent were obtained before data collection. The validated questionnaire was then administered to the respondents.

During the data-retrieval phase, the researcher obtained the respondents' Written Output and Performance Task records for the First Term from the official TLE class records. Survey responses were matched with performance records using anonymous learner codes to protect respondents' identities and confidentiality.

During the post-implementation phase, the researcher encoded, organized, and analyzed the data using the appropriate descriptive and correlational statistical procedures. The findings were used to formulate the conclusions and recommendations of the study.

During the action-planning phase, the researcher developed a contextualized ICT-integrated instructional intervention based on the findings. The proposed intervention was designed to strengthen learners' Written Outputs, sustain practical competence, improve responsible ICT use, and address digital-access and instructional-support needs.

Scoring Procedure

The learners' ICT use was scored using a five-point Likert scale.

Table 2. Scoring Scale for Learners' ICT Use

Weight	Range	Verbal Description
5	4.21–5.00	Very High Extent
4	3.41–4.20	High Extent
3	2.61–3.40	Moderate Extent
2	1.81–2.60	Low Extent
1	1.00–1.80	Very Low Extent

For Home Digital Access, Responsible Use of ICT, and Learners' Perception of ICT Use in TLE, the following scoring procedure was used.

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

Table 3. Scoring Scale for Home Digital Access, Responsible Use of ICT, and Learners' Perception of ICT Use in TLE

Scale	Description
5	Strongly Agree
4	Agree
3	Moderately Agree
2	Disagree
1	Strongly Disagree

For the learners' TLE performance, the study used the grading scale and performance records of the school, specifically for Written Outputs and Performance Tasks. The performance level was interpreted using the following scale:

Table 4. Grade Scale for TLE Learning Performance

Grade Range	Verbal Description
90–100	Outstanding
85–89	Very Satisfactory
80–84	Satisfactory
75–79	Fairly Satisfactory
Below 75	Did Not Meet Expectations

Data Analysis

The following statistical tools were used to analyze the data.

Frequency and Percentage. These statistics were used to describe the distribution of respondents and their digital-access profile.

Weighted Mean and Standard Deviation. These were used to determine the extent of ICT utilization and the levels of Home Digital Access, Responsible ICT Use, and Learners' Perception of ICT Use in TLE.

Mean and Standard Deviation. These were used to describe learners' TLE performance in terms of Written Outputs and Performance Tasks.

Pearson Product-Moment Correlation Coefficient. This statistic was used to determine whether a significant relationship existed between learners' overall ICT utilization and their Written Outputs and Performance Tasks. The null hypotheses were tested at the 0.05 level of significance.

Ethical Considerations

To ensure the protection, dignity, and rights of all human participants involved in this study, the researcher strictly adhered to established institutional and national ethical guidelines. Because the respondents were Junior High School students (minors), the following explicit ethical safeguards were implemented:

Informed Consent and Assent. Prior to data collection, formal Informed Consent Forms were written in clear, accessible language and distributed to the parents or legal guardians of the sampled students. Concurrently, Student Assent Forms were provided directly to the learners. Data collection proceeded only for learners whose parents or legal guardians provided consent and who personally provided assent.

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

Voluntary Participation and Right to Withdraw. Participants were explicitly informed that their involvement was completely voluntary. They were informed that withdrawing from the study at any point would not result in any penalty or affect their grades or standing.

Anonymity and Confidentiality. To eliminate social and academic risks, student identities were decoupled from their responses. Code numbers (e.g., Respondent 001) were utilized instead of names during data entry. The electronic matching of survey responses with School Class Record academic grades was performed exclusively by the researcher using encrypted spreadsheets.

Compliance with the Data Privacy Act of 2012 (RA 10173). All gathered datasets, including digital survey responses and academic grade extractions, were securely stored in a password-protected cloud drive accessible only to the primary researcher. In strict compliance with Philippine law, the data will be retained securely for one year after the institutional acceptance of the thesis, after which electronic files will be permanently deleted and printed materials will be appropriately destroyed.

Beneficence and Non-Maleficence. The study involved minimal risk, primarily possible discomfort when answering survey questions and potential confidentiality concerns related to the matching of survey responses and performance records. Appropriate safeguards, including voluntary participation, anonymous learner codes, restricted data access, and secure storage, were implemented to minimize these risks.

Operational Definition of Terms

For a clearer understanding of this study, the following terms are defined operationally.

Frequency of Access. Frequency of ICT Access refers to the reported extent to which learners regularly engaged in ICT-supported TLE activities. It was measured using ten statements rated on a five-point scale ranging from Very Low Extent to Very High Extent.

Home Digital Access. Refers to the socioeconomic baseline of the student regarding technology at home. In this study, it is categorized based on the student's self-reported ownership of hardware and the stability of their internet connection.

Learners' Use of Information and Communication Technology (ICT). Refers to the student-driven deployment of digital hardware and software to facilitate their own learning. In this study, it is measured by the total and sub-dimension scores obtained from the student survey questionnaire.

Learning Performance in Technology and Livelihood Education (TLE). Refers to the academic achievement and skill proficiency demonstrated by the student in their TLE subject.

Performance Tasks. Refers to the graded component of the TLE curriculum that evaluates the practical, hands-on application of concepts (e.g., cooking, computer troubleshooting, drafting). In this study, it is measured through the accumulated scores in the performance task column of the teacher's class record, which constitutes the heaviest weight of the TLE quarterly grade.

Purpose of Utilization. Refers to the academic purposes for which learners used ICT in TLE. It was measured through ten statements rated on a five-point extent scale.

TLE Sector or Component. Refers to the specific sub-classification of the vocational track the student is currently taking. In this study, it is categorized into four distinct groups based on school enrollment records: Family and Consumer Science, Industrial Arts (IA), Agricultural and Fishery Arts (AFA), and Information and Communications Technology (ICT).

Types of ICT Tools Deployed. Refers to the devices, applications, platforms, and specialized software used by learners for TLE-related activities. It was measured through ten statements rated on a five-point extent scale.

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

Written Outputs. Refers to the graded component of the TLE curriculum that assesses the student's theoretical and conceptual knowledge retention. In this study, it is operationally defined as the raw and percentage scores derived from quizzes, unit tests, and long examinations as recorded in the teacher's official class record.

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

RESULTS AND DISCUSSION

This section presents, analyzes, and interprets the data gathered on learners' use of Information and Communication Technology (ICT) and their learning performance in Technology and Livelihood Education (TLE). The presentation follows the sequence of the statement of the problem and includes descriptive statistics, correlation analysis, and open-ended response summaries. The ICT-integrated intervention plan that follows from the findings is presented under Conclusions and Recommendations. The data were obtained from the learners' ICT survey responses and documented TLE performance records for term 1 for School Year 2026–2027.

Extent of Learners' Use of ICT in TLE

The extent of learners' ICT utilization was examined in terms of frequency of access, purpose of utilization, and types of ICT tools deployed. Weighted mean and standard deviation were used to determine the extent of ICT utilization for each dimension and indicator, as well as the overall level of ICT utilization.

The findings revealed that the learners' overall use of Information and Communication Technology in TLE obtained a grand weighted mean of 3.73 and a standard deviation of 1.12, verbally interpreted as High Extent. This indicates that learners regularly use digital devices, applications, online platforms, and internet-based resources to support their TLE learning activities. The result reflects the growing importance of digital technology in contemporary education, where ICT is used to make learning resources more accessible, engaging, interactive, and responsive to learners' needs. Zou et al. (2025) explained that digital learning has become an important component of modern education because it can support accessibility, learner engagement, personalization, and the delivery of instructional content. Similarly, the digitalization of TLE instruction has enabled teachers and learners to use platforms such as Google Classroom, Google Docs, Canva, Kahoot, Quizizz, and TinkerCAD to support conceptual understanding and practical skill development.

Frequency of ICT Access

The frequency of ICT access is presented in Table 5.

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

Table 5. Frequency of ICT Access

S/N	Indicators	WM	SD	Verbal Description
1	I use ICT tools for my TLE subject.	3.36	1.25	Moderate Extent
2	I use the internet to search for TLE-related information.	4.05	0.92	High Extent
3	I watch video demonstrations related to TLE lessons.	3.71	1.09	High Extent
4	I use digital tools when preparing TLE assignments.	3.75	1.13	High Extent
5	I use ICT when making projects or performance-based outputs in TLE.	3.75	1.10	High Extent
6	I use ICT to communicate with my classmates about TLE tasks.	3.60	1.10	High Extent
7	I use ICT to communicate with my TLE teacher when needed.	3.56	1.05	High Extent
8	I use ICT to review for quizzes, tests, or written activities in TLE.	3.57	1.14	High Extent
9	I use ICT during group work or collaborative TLE projects.	3.56	1.26	High Extent
10	I use ICT outside school hours to improve my understanding of TLE lessons.	3.45	1.18	High Extent
	Aggregate Mean	**3.64**		**High Extent**
	Standard Deviation		**1.14**	

Legend: 4.21–5.00, Very High Extent; 3.41–4.20, High Extent; 2.61–3.40, Moderate Extent; 1.81–2.60, Low Extent; and 1.00–1.80, Very Low Extent.

The dimension Frequency of ICT Access obtained the lowest weighted mean among the three dimensions at 3.64, although it was still interpreted as High Extent. This means that learners frequently access ICT for TLE learning, but the regularity of access may vary according to device availability, connectivity, school schedules, and home learning conditions. Although frequency of access provides learners with more opportunities to obtain information and complete tasks, frequent technology use does not automatically result in improved academic performance. Digital learning outcomes continue to depend on instructional quality, learner digital competence, appropriate learning activities, equitable access, and the guidance provided by teachers. Zou et al. (2025) noted that the educational potential of digital technology can be limited by technical, pedagogical, and socioeconomic challenges. The TLE digitalization case study also found that limited devices, unstable internet connectivity, and inadequate teacher preparation may hinder learners from fully benefiting from digital instruction.

Purpose of ICT Utilization

Table 6 shows that the Purpose of ICT Utilization obtained an aggregate weighted mean of 3.81 and a standard deviation of 1.04, interpreted as High Extent**.** This indicates that learners frequently used ICT for meaningful TLE-related purposes, including understanding concepts, searching for information, watching demonstrations, preparing written and digital outputs, planning projects, collaborating with classmates, documenting performance tasks, and improving the quality of their work. The standard deviation suggests some variation in learners' experiences, which may be associated with differences in digital skills, device availability, connectivity, task requirements, and teacher guidance.

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

The highest-rated indicator was the use of ICT to create presentations, posters, and other digital outputs, with a weighted mean of 4.00. This was followed by the use of ICT to improve the quality of TLE outputs, with a weighted mean of 3.93, and to document performance tasks through photographs, videos, or digital files, with a weighted mean of 3.86. These results show that learners primarily used ICT for creating, presenting, improving, and documenting their work. Digital tools may help learners organize information, combine text and visual elements, revise outputs, and present evidence of completed tasks. However, teachers should ensure that digital outputs are assessed not only for visual appeal but also for accuracy, originality, organization, relevance, and alignment with the intended TLE competency.

The lowest-rated indicator concerned the use of ICT to practice or simulate skills related to TLE, with a weighted mean of 3.64, followed by collaboration with groupmates, with a weighted mean of 3.65. Although both were still interpreted as High Extent, the results suggest that learners used ICT less frequently for simulation, technology-supported practice, and structured collaboration than for output creation. This may reflect limited access to specialized software, insufficient exposure to simulation tools, incompatible devices, or the greater emphasis placed on presentations and documentation.

Table 6. Purpose of ICT Utilization

S/N	Indicators	WM	SD	Verbal Description
1	I use ICT to understand TLE concepts better.	3.80	0.95	High Extent
2	I use ICT to search for definitions, procedures, and examples related to TLE.	3.80	1.09	High Extent
3	I use ICT to watch demonstrations of skills or processes in TLE.	3.72	1.11	High Extent
4	I use ICT to prepare written outputs such as reports, worksheets, and reflections.	3.83	1.04	High Extent
5	I use ICT to create presentations, posters, or other digital outputs.	4.00	0.97	High Extent
6	I use ICT to plan and design TLE projects.	3.83	1.01	High Extent
7	I use ICT to practice or simulate skills related to my TLE specialization.	3.64	1.00	High Extent
8	I use ICT to collaborate with groupmates in completing TLE tasks.	3.65	1.12	High Extent
9	I use ICT to document my performance tasks through photos, videos, or digital files.	3.86	1.06	High Extent
10	I use ICT to improve the quality of my TLE outputs.	3.93	1.02	High Extent
	Aggregate Mean	**3.81**		**High Extent**
	Standard Deviation		**1.04**	

Legend: 4.21–5.00, Very High Extent; 3.41–4.20, High Extent; 2.61–3.40, Moderate Extent; 1.81–2.60, Low Extent; and 1.00–1.80, Very Low Extent.

The findings support the view that technology becomes educationally valuable when it is aligned with instructional goals, appropriate learning activities, and teacher guidance. UNESCO (2023) emphasized that technology in education should support learner needs, equity, relevance, and meaningful human interaction. Zou et al. (2025) similarly explained that digital technologies can promote accessibility, engagement, and personalized learning, but their effectiveness depends on pedagogical quality, infrastructure, and educator competence. Therefore, TLE teachers should build on learners' familiarity with digital-output creation while expanding ICT

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

integration toward guided research, simulation, collaborative problem-solving, reflection, and direct application in practical activities.

Types of ICT Tools Deployed

Table 7 shows that the Types of ICT Tools Deployed obtained an aggregate weighted mean of 3.76 and a standard deviation of 1.17, interpreted as High Extent**.** This indicates that learners used various digital devices, communication applications, search tools, video platforms, productivity programs, learning-management systems, and specialized applications in completing TLE-related activities. The relatively high standard deviation suggests that learners differed in the types of devices and applications available to them.

The most frequently used tools were presentation applications such as PowerPoint, Canva, and Google Slides, with a weighted mean of 4.04, followed by messaging applications such as Messenger and group chats, with a weighted mean of 4.03. Smartphones, video platforms, and search engines were also used to a high extent. These results suggest that learners preferred familiar, accessible, and mobile-friendly tools for preparing presentations, communicating with classmates and teachers, searching for information, and watching demonstrations.

Table 7. Types of ICT Tools Deployed

Item	Indicator	WM	SD	Verbal Description
1	I use smartphones for TLE-related learning activities.	3.87	1.05	High Extent
2	I use computers, laptops, or tablets for TLE-related tasks.	3.39	1.30	Moderate Extent
3	I use search engines such as Google to look for TLE information.	3.84	1.14	High Extent
4	I use video platforms such as YouTube to watch TLE demonstrations.	3.86	1.01	High Extent
5	I use messaging applications such as Messenger or group chats for TLE communication.	4.03	1.11	High Extent
6	I use learning platforms such as Google Classroom or other online classrooms.	3.69	1.17	High Extent
7	I use word processing tools such as Microsoft Word or Google Docs.	3.66	1.18	High Extent
8	I use presentation tools such as PowerPoint, Canva, or Google Slides.	4.04	1.14	High Extent
9	I use spreadsheet tools such as Microsoft Excel or Google Sheets.	3.47	1.22	High Extent
10	I use specialized TLE-related digital tools such as design apps, simulation tools, editing tools, or vocational software.	3.71	1.21	High Extent
	Aggregate Mean	**3.76**		**High Extent**
	Standard Deviation		**1.17**	

Legend: 4.21–5.00, Very High Extent; 3.41–4.20, High Extent; 2.61–3.40, Moderate Extent; 1.81–2.60, Low Extent; and 1.00–1.80, Very Low Extent.

These applications are useful for organizing ideas and supporting communication, but teachers should establish clear academic expectations to prevent distraction, unequal participation, and overemphasis on visual design.

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

The lowest-rated tool category was the use of computers, laptops, or tablets for TLE-related tasks, with a weighted mean of 3.39, interpreted as Moderate Extent**.** Spreadsheet applications also received a comparatively lower rating, although their use remained within the High Extent category. These results indicate that learners had less consistent access to larger devices and more specialized productivity tools. This is important because word processing, spreadsheets, simulations, and advanced applications may be more difficult to use effectively through smartphones alone.

UNESCO (2023) emphasized that educational technology selection should be guided by relevance, equity, accessibility, and sustainability rather than novelty. Research on digitalized TLE instruction also indicates that digital platforms may improve engagement and conceptual understanding, but limited devices, unreliable connectivity, and insufficient teacher preparation can restrict effective implementation. Accordingly, the school should continue supporting mobile-accessible learning while providing scheduled computer-laboratory access, offline resources, shared-device arrangements, and targeted training in word processing, spreadsheets, presentation tools, and applications directly relevant to Family and Consumer Science.

Summary of ICT Utilization by Dimension

Table 8 shows that all three dimensions of ICT utilization were interpreted as High Extent**.** Purpose of ICT Utilization obtained the highest weighted mean of 3.81 with a standard deviation of 1.04. Types of ICT Tools Deployed followed with a weighted mean of 3.76 and a standard deviation of 1.17**.** Frequency of ICT Access obtained the lowest mean of 3.64 and a standard deviation of 1.14. Overall ICT Utilization obtained a grand weighted mean of 3.73 and a standard deviation of 1.12, interpreted as High Extent.

Purpose of utilization was the highest-rated dimension and displayed the lowest variability. This suggests that learners were relatively consistent in recognizing and applying ICT for TLE-related purposes, even though their access frequency and available tools varied.

Table 8. Summary of ICT Utilization by Dimension

Dimension	WM	SD	Verbal Description
Frequency of ICT Access	3.64	1.14	High Extent
Purpose of ICT Utilization	3.81	1.04	High Extent
Types of ICT Tools Deployed	3.76	1.17	High Extent
ICT Utilization	**3.73**	**1.12**	**High Extent**

This is an important finding because educationally meaningful ICT use depends more on what learners do with technology than on how often they access it. UNESCO argues that technology should support relevant, equitable, sustainable, and learner-centered education rather than be implemented as an end in itself. Varga and Napoles (2025) likewise emphasized the integration of instructional design, usability, and technology acceptance in TLE-ICT learning environments.

The second-highest dimension indicates that learners used varied digital resources. However, the larger standard deviation suggests unequal patterns of access and tool competence.

Some learners may have used productivity applications, learning platforms, spreadsheets, and specialized software, while others depended mainly on smartphones, messaging tools, search engines, and videos. Therefore, variety at the group level should not be interpreted as equal access at the individual level.

Frequency of ICT Access obtained the lowest mean, although it remained within the High Extent range. This suggests that learners used ICT regularly, but access may not have been continuous or equally available.

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

Device sharing, mobile-data limitations, unstable internet, school schedules, and home responsibilities may affect how frequently learners use ICT. The difference between purpose and frequency suggests that learners may use technology meaningfully when access is available, even if access is not constant.

The grand mean of 3.73 indicates that ICT was embedded in learners' TLE activities. However, the result should not be interpreted as evidence that ICT use automatically improved learning performance. High utilization describes the extent of technology use, not its causal effect on grades.

Recent TLE research indicates that digital platforms can strengthen engagement, conceptual understanding, and practical skills, while simultaneously showing that infrastructure, device availability, connectivity, and teacher training influence implementation quality. Broader reviews likewise conclude that successful digital learning depends on pedagogy, access, educator capacity, and continuous professional development.

Additional related studies further support the high extent of ICT utilization reported in Table 8. Salazar (2026) found a high level of technology integration in TLE, particularly in activities that fostered critical thinking, collaboration, creativity, and practical skills. Valverde-Berrocoso, Acevedo-Borrega, and Cerezo-Pizarro (2022) likewise explained that ICT-enriched practices may support performance when technology is connected to appropriate pedagogy, curricular goals, and meaningful learning activities.

Mbambo and du Plessis (2025) emphasized that digital skills are essential for learners to participate successfully in technology-supported academic work. Rahmawati, Abdullah, and Widiaty (2025) further observed that digital and social competencies are increasingly important in vocational education because learners must combine technical proficiency, communication, and adaptability in technology-driven learning environments.

Home Digital Access, Responsible Use of ICT, and Learners' Perception of ICT

Home Digital Access

Table 9 shows that Home Digital Access obtained an overall weighted mean of 3.77 and a standard deviation of 1.08, interpreted as Agree. This indicates that learners generally had access to devices, internet connectivity, mobile data, and home conditions that enabled them to participate in ICT-supported TLE activities. However, the standard deviation suggests that home digital access was not equally experienced by all learners.

The highest-rated indicator was access to a device that could be used for schoolwork, with a weighted mean of 4.04. Regular internet access also received a favorable rating. These findings indicate that most learners had basic digital resources for researching information, watching demonstrations, preparing outputs, communicating about TLE tasks, and submitting requirements. Nevertheless, access to a device did not necessarily mean exclusive or uninterrupted access, as learners also agreed that devices were sometimes shared with family members.

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

Table 9. Home Digital Access

S/N	Indicator	WM	SD	Verbal Description
1	I have access to a device that I can use for schoolwork.	4.04	1.00	Agree
2	I can use a device whenever I need to complete TLE tasks.	3.83	1.06	Agree
3	I share a device with other family members.	3.43	1.18	Agree
4	I have regular internet access at home.	3.93	1.04	Agree
5	My internet connection at home is stable enough for school-related tasks.	3.83	0.96	Agree
6	I have enough mobile data or internet load for online learning activities.	3.68	1.18	Agree
7	I can watch online videos or demonstrations without major connection problems.	3.76	1.04	Agree
8	I can submit digital outputs or assignments online when required.	3.85	1.03	Agree
9	I have a quiet or suitable place at home for doing ICT-based schoolwork.	3.58	1.04	Agree
10	My home digital access helps me complete my TLE requirements.	3.76	1.08	Agree
Overall	**Home Digital Access**	**3.77**	**1.08**	**Agree**

The lowest-rated indicator concerned having a quiet or suitable place at home for completing ICT-based schoolwork, with a weighted mean of 3.58. The sufficiency of mobile data or internet load also received a comparatively lower rating. These results suggest that some learners may have experienced distractions, limited study space, device-sharing arrangements, unstable connectivity, or insufficient data. Such conditions may affect the time and quality of their participation in digital learning activities.

SETDA (2025) explained that meaningful educational access requires more than ownership of a device. It also involves dependable connectivity, sufficient opportunities to use technology, technical support, and appropriate learning conditions. UNESCO (2025) likewise emphasized that learners in low-resource settings continue to experience inequalities involving devices, connectivity, and digital infrastructure. Therefore, the school should provide low-bandwidth and offline materials, flexible submission arrangements, scheduled access to school ICT facilities, shared-device options, and printed alternatives for learners experiencing access limitations.

Responsible Use of ICT

Table 10 shows that Responsible Use of ICT obtained an overall weighted mean of 3.81 and a standard deviation of 1.05, interpreted as Agree. This indicates that learners generally perceived themselves as using ICT in purposeful, ethical, respectful, and productive ways. They reported evaluating online information, acknowledging digital sources, communicating respectfully, managing their time, avoiding direct copying, and using technology to improve the quality of TLE outputs.

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

Table 10. Responsible Use of ICT

S/N	Indicator	WM	SD	Verbal Description
1	I use ICT mainly for learning when doing TLE tasks.	3.73	0.97	Agree
2	I avoid using ICT for unrelated activities while doing schoolwork.	3.42	1.18	Agree
3	I check if the information I get online is reliable.	3.98	0.97	Agree
4	I give proper credit when I use information, pictures, or videos from online sources.	3.75	1.00	Agree
5	I use ICT respectfully when communicating with classmates and teachers.	3.88	1.08	Agree
6	I avoid copying answers directly from the internet.	3.72	1.06	Agree
7	I use ICT to improve my own understanding instead of depending only on copied materials.	3.87	1.07	Agree
8	I manage my time properly when using ICT for TLE activities.	3.92	1.09	Agree
9	I use ICT tools to become more creative and productive in my TLE outputs.	3.83	1.00	Agree
10	I believe that responsible ICT use can help improve my performance in TLE.	4.01	0.90	Agree
Overall	**Responsible Use of ICT**	**3.81**	**1.05**	**Agree**

The highest-rated indicator was the belief that responsible ICT use could improve TLE performance, with a weighted mean of 4.01. This was followed by checking whether online information was reliable, with a weighted mean of 3.98, and managing time during ICT-supported TLE activities, with a weighted mean of 3.92. These findings suggest that learners recognized the importance of disciplined technology use, source evaluation, and time management. However, these responses represent self-reported perceptions and should not be treated as direct evidence that responsible ICT behavior caused higher grades.

The lowest-rated indicator was avoiding unrelated activities while using ICT for schoolwork, with a weighted mean of 3.42. Although still interpreted as Agree, this result indicates that digital distraction was the most challenging aspect of responsible use. Since the same devices used for schoolwork also provide access to social media, games, videos, and private communication, learners may experience difficulty maintaining focus during ICT-based activities.

The Council of Europe (2023) described digital citizenship as the combination of values, knowledge, skills, attitudes, and critical understanding necessary for responsible participation in digital environments. Responsible ICT use should therefore include source evaluation, citation, academic integrity, respectful communication, privacy protection, self-regulation, and constructive digital participation. TLE teachers should integrate short digital-citizenship activities into regular instruction and assess responsible use through observable learner behavior and submitted outputs rather than through self-reported agreement alone.

Learners' Perception of ICT Use in TLE

Table 11 shows that Learners' Perception of ICT Use in TLE obtained an overall weighted mean of 3.93 and a standard deviation of 0.96, interpreted as Agree. This indicates that learners generally perceived ICT as useful in

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

understanding lessons, preparing outputs, learning procedures, communicating with classmates, developing creativity, and improving their overall TLE learning experience. The relatively lower standard deviation suggests greater consistency in learners' responses than in the other ICT-related dimensions.

Table 11. Learners' Perception of ICT Use in TLE

S/N	Indicator	WM	SD	Verbal Description
1	ICT helps me understand TLE lessons better.	4.20	0.80	Agree
2	ICT makes TLE activities more interesting.	3.86	0.94	Agree
3	ICT helps me complete written outputs more effectively.	3.94	0.99	Agree
4	ICT helps me perform better in hands-on TLE tasks.	3.72	1.07	Agree
5	Video demonstrations help me understand TLE procedures.	4.02	0.93	Agree
6	Digital tools help me become more creative in my TLE outputs.	3.99	0.89	Agree
7	ICT helps me communicate and collaborate with classmates.	3.90	0.95	Agree
8	ICT helps me prepare for quizzes and written activities.	3.79	1.03	Agree
9	ICT helps me improve my practical skills in TLE.	3.88	0.95	Agree
10	ICT use can improve my overall learning performance in TLE.	4.00	0.95	Agree
Overall	**Learners' Perception of ICT Use in TLE**	**3.93**	**0.96**	**Agree**

The highest-rated indicator was the statement that ICT helped learners understand TLE lessons better, with a weighted mean of 4.20. Video demonstrations were also highly rated, indicating that learners valued visual and procedural resources. Digital videos, diagrams, presentations, and step-by-step guides may help learners observe materials, processes, safety practices, and procedural sequences more clearly. However, these resources should support rather than replace teacher demonstrations, supervised practice, and corrective feedback. Learners also agreed that digital tools promoted creativity, improved written-output preparation, and supported communication and collaboration. The lowest-rated indicator concerned the contribution of ICT to better performance in hands-on tasks, with a weighted mean of 3.72. Although favorable, this result suggests that learners recognized the limitations of technology in developing practical competence. Videos and simulations may clarify a procedure, but actual mastery requires access to tools and materials, repeated practice, safety supervision, and direct feedback.

Pearce (2022) emphasized that perceived usefulness and ease of use influence learners' willingness to adopt educational technology. However, favorable perceptions should not be equated with demonstrated improvement in academic performance. Learners may view ICT as interesting and useful even when its statistical relationship with grades is weak or nonsignificant. Therefore, teachers should build on learners' positive attitudes by connecting digital resources with clearly defined competencies, structured written activities, authentic performance tasks, and opportunities for guided practice.

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

Integrated Discussion of the ICT-Related Dimensions

The combined findings present a generally favorable ICT context among the learners. First, learners agreed that they had adequate home digital access, although device sharing, data sufficiency, connection quality, and suitable study space remained possible limitations. Second, learners reported responsible ICT practices involving information evaluation, ethical attribution, respectful communication, originality, time management, and academic purpose. Third, learners perceived ICT as useful for understanding lessons, developing creativity, preparing written outputs, collaborating with classmates, and improving practical learning.

These dimensions are interconnected. Home access provides the opportunity to use technology, responsible use determines how that opportunity is managed, and positive perception influences learners' willingness to adopt ICT for educational activities. Weakness in any one dimension can restrict the benefits of the others. A learner may value ICT but have unstable connectivity; another may have strong access but use technology primarily for unrelated activities; another may use ICT responsibly but lack the digital competence needed to produce high-quality outputs.

The results therefore support a balanced approach to ICT integration. Schools should improve access and inclusive alternatives, teachers should strengthen digital citizenship and information-literacy instruction, and TLE activities should connect ICT use with clearly defined written and practical outcomes. This approach is consistent with recommendations that effective digital learning combine access, equity, critical competence, usability, responsible participation, and purposeful instructional design.

Level of TLE Learning Performance

The learners' TLE learning performance was described using weighted mean, standard deviation, and grade interpretation. Written Outputs represent conceptual and written academic requirements, while Performance Tasks represent practical and hands-on outputs in TLE.

Learning performance in Technology and Livelihood Education reflects both learners' conceptual understanding and their ability to apply knowledge and skills in practical contexts. Written Outputs measure competencies demonstrated through quizzes, worksheets, reports, reflections, research activities, procedure writing, and other written requirements. Performance Tasks assess learners' ability to apply TLE knowledge through projects, demonstrations, product development, hands-on activities, and other authentic outputs.

Because TLE combines cognitive knowledge with practical competence, differences between Written Outputs and Performance Tasks may reflect the distinct demands of the two assessment components. Performance tasks generally provide learners with opportunities to demonstrate procedural skills, creativity, problem-solving, and application. Written outputs require reading comprehension, content recall, written communication, organization of ideas, and the ability to explain technical concepts accurately.

Table 12 shows that the learners' Written Outputs obtained a mean of 75.81 and a standard deviation of 15.15, verbally interpreted as Fairly Satisfactory. By comparison, Performance Tasks obtained a considerably higher mean of 88.75 and a standard deviation of 10.78, interpreted as Very Satisfactory. The learners' Composite TLE Performance Score yielded a weighted mean of 82.28 and a standard deviation of 10.67, interpreted as Satisfactory. These results indicate that the learners generally met the expected competencies in TLE but performed more successfully in practical and performance-based activities than in written requirements.

Table 12. Level of TLE Learning Performance

TLE Learning Performance Area	N	Mean	SD	Grade Interpretation
Written Outputs	100	75.81	15.15	Fairly Satisfactory
Performance Tasks	100	88.75	10.78	Very Satisfactory
Composite TLE Performance Scores	**100**	**82.28**	**10.67**	**Satisfactory**

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

Note. The Composite TLE Performance Score was calculated for research purposes by averaging the Written Output and Performance Task scores. It does not represent the official term TLE grade unless computed using the prescribed classroom-assessment weights.

Overall, Table 12 demonstrates that learners were more successful in applying TLE competencies than in communicating their conceptual understanding through written outputs. This difference suggests that instruction should preserve hands-on and performance-based learning while providing additional support for written expression, research, technical vocabulary, information organization, reflection, and documentation.

ICT may support this objective through structured templates, guided digital worksheets, interactive quizzes, video-based procedure analysis, collaborative documents, digital portfolios, and teacher feedback. However, ICT should be used to strengthen the learning process rather than merely accelerate output completion. The systematic review of Valverde-Berrocoso et al. (2022) found evidence that ICT-enriched practices can improve achievement, but the results remain dependent on instructional quality and learning context. Research on vocational teachers' technological pedagogical content knowledge similarly indicates that effective ICT integration requires targeted professional support and alignment between technology, pedagogy, content, assessment, and students' learning performance.

Therefore, the findings indicate that the learners possessed stronger practical than written competencies in TLE. The Satisfactory overall performance shows that the respondents generally met learning expectations, but the Fairly Satisfactory level of Written Outputs requires targeted intervention. Teachers should sustain authentic performance tasks while integrating structured reading, writing, research, reflection, and documentation activities into TLE instruction. ICT should be used as a guided support for both practical performance and the development of written academic competence.

Relationship Between ICT Use and TLE Learning Performance

The Pearson Product-Moment Correlation Coefficient was used to determine whether learners' overall ICT use was significantly related to their TLE learning performance in terms of Written Outputs and Performance Tasks. The null hypothesis stated that there was no significant relationship between the variables. The decision rule was set at the 0.05 level of significance**.**

Table 13 shows that the relationship between ICT Use and Written Outputs produced a correlation coefficient of approximately $r = -0.04$ and a p-value of 0.66. The relationship between ICT Use and Performance Tasks yielded approximately $r = -0.08$ and a p-value of 0.42. Both coefficients indicate very low negative relationships, and both p-values are greater than the 0.05 level of significance. Consequently, both relationships were interpreted as not statistically significant, and the null hypotheses were not rejected.

Table 13. Pearson Correlation Between ICT Use and TLE Learning Performance

Relationship Tested	N	r	p-value	Direction	Magnitude	Interpretation	Decision
ICT Use and Written Outputs	100	−0.04	0.66	Negative	Very Low	Not Significant	Fail to reject H_0
ICT Use and Performance Tasks	100	−0.08	0.42	Negative	Very Low	Not Significant	Fail to reject H_0

The correlation between ICT Use and Written Outputs, $r = -0.044$, $p = 0.661$**,** indicates an almost negligible negative association. The coefficient is extremely close to zero, meaning that learners with higher reported ICT use did not consistently obtain higher or lower Written Output scores.

The p-value of 0.661 is substantially greater than 0.05. Therefore, the observed coefficient may reasonably be attributed to sampling variation rather than a systematic relationship between ICT use and written performance.

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

The null hypothesis stating that no significant relationship exists between ICT use and Written Outputs was not rejected.

This result does not mean that ICT is educationally useless. Rather, it means that overall ICT use, as measured in this study, did not significantly influence in Written Output scores. The way learners use ICT may be more important than the amount or frequency of use. Learners may use smartphones and internet resources regularly, but their activities may include both academic and non-academic purposes. Even academic use may involve passive searching, viewing, or copying rather than active reading, source evaluation, synthesis, and original writing.

Valverde-Berrocoso et al. (2022) reviewed 100 studies and found mixed evidence concerning the influence of ICT on academic performance. Some ICT-enriched practices improved achievement, while large-scale studies often found limited gains attributable to technology use alone. The review emphasized that ICT effects depend on pedagogy, curricular alignment, subject area, and learning context.

Nouri et al. (2022) found that ICT access and use were significantly connected with academic achievement and motivation among secondary learners, but access and use at school were more influential than general home or out-of-school use. This suggests that teacher-guided, school-based ICT activities may be more academically focused than unsupervised or general technology use.

The non-significant result may also be explained by the skills required in Written Outputs. Digital access does not automatically develop reading comprehension, technical vocabulary, logical organization, evidence-based writing, or the ability to communicate procedures accurately. ICT becomes more educationally valuable when teachers provide writing structures, research guides, feedback, source-evaluation activities, and clearly defined output criteria.

The correlation between ICT Use and Performance Tasks, $r = -0.082$, $p = 0.418$**,** also indicates a very low negative and statistically non-significant relationship. The coefficient suggests that increased ICT use was associated with a very small decrease in Performance Task scores, but the magnitude was too small and the p-value too high to support a meaningful relationship.

The null hypothesis stating that no significant relationship exists between ICT Use and Performance Tasks was therefore not rejected. Learners' reported ICT use did not reliably correspond to their practical TLE performance.

This finding may be explained by the nature of Performance Tasks. ICT can assist learners in viewing demonstrations, researching procedures, planning projects, preparing designs, and documenting outputs. However, actual performance also depends on access to tools and materials, procedural practice, teacher supervision, safety awareness, motor coordination, persistence, teamwork, and the quality of feedback. Watching an instructional video does not necessarily produce practical mastery unless the learner has opportunities to perform the procedure repeatedly and correct errors.

UNESCO's TVET strategy emphasizes that vocational learning should develop practical skills, digital competence, employability, and lifelong learning through inclusive and work-relevant systems. TESDA's national plan similarly prioritizes demand-driven and future-ready skills, indicating that technology should be connected with practical training and workforce requirements.

The finding is also consistent with research showing that technology-related behavior can produce mixed academic results. Kuş (2025), in a meta-analysis of 63 studies involving 124,166 students, found a small negative association between smartphone use, social media use, video-game participation, and academic performance. This suggests that the effect of technology depends on purpose, intensity, self-regulation, and context.

Similarly, Xiong, Nie, Bai, and Lee (2025) found nonlinear relationships between out-of-school ICT use and academic performance across several PISA cycles. Both entertainment-related and learning-related ICT use

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

demonstrated patterns in which increasing use did not always correspond to continuously improving achievement. This supports the view that balanced, academically focused technology use may be more beneficial than simply maximizing frequency.

Taken together, the two correlation results demonstrate that learners' overall ICT use was not significantly associated with either written or practical TLE performance. The coefficients were very small and negative, while the p-values were well above 0.05.

The absence of significant relationships may indicate that the ICT-use measure captured general patterns rather than the quality of technology integration for specific TLE competencies. Two learners may report similar levels of ICT use but engage in substantially different activities. One may use ICT to analyze procedures, prepare original outputs, and seek feedback. Another may use the same technology mainly for entertainment, passive viewing, or copying information. Their reported frequency may be similar, but the educational quality of their use differs.

This interpretation supports a move from measuring how much ICT is used toward examining the academic purpose of ICT use; learners' digital and information literacy; the quality of teacher guidance; alignment with TLE competencies; opportunities to apply digital information in practical tasks; learners' self-regulation and responsible use; the quality and stability of home and school access; and the appropriateness of the selected ICT tools.

Therefore, the findings indicate that ICT use alone did not significantly influence Written Outputs or Performance Tasks. The educational contribution of ICT appears to depend on how technology is integrated into instruction, the competence of the learner, the type of task, teacher guidance, and opportunities to apply digital information. The results supported the decision not to reject the null hypotheses while supporting a structured ICT-integrated intervention focused on purposeful use, digital literacy, original output production, hands-on practice, and feedback.

Synthesized Learners' Response to the Utilization of ICT in TLE – Family and Consumer Science

The open-ended responses were examined to support the quantitative findings and provide learner-based evidence for the proposed integrated intervention plan. The responses were grouped according to recurring ideas concerning frequently used ICT tools, purposes of use, difficulties encountered, and recommended forms of support.

The qualitative responses should be interpreted as contextual evidence. The themes help explain how learners use ICT and what difficulties they encounter, but frequencies should not be inferred unless the number of responses within each theme was formally counted.

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

Table 14. Synthesized Learners' Response to the Utilization of ICT in TLE – Family and Consumer Science

Open-Ended Question	Major Themes	Representative Learner Quotes
ICT tools used most often	Smartphones/cellphones; computers/laptops/tablets; AutoCAD/design software; Google/internet search tools; Canva/presentation tools	Learners mentioned: 'PHONE', 'Laptop, smartphones, and tablet', and 'Google Classroom, Gmail, AutoCAD, Computer.'
Reasons for using ICT	Completing tasks/projects; searching for information; understanding lessons; creating presentations/reports; working faster	Learners wrote: 'TO DO SOME TASK OR ACTIVITIES THAT ARE ASSIGN TO US' and 'Because it helps me to make the activity faster.'
Problems encountered	Unstable or slow internet; limited devices; computer/software issues; difficulty using some tools	Learners reported: 'poor internet connection', 'No Wifi Connection', and 'Slow internet connection, lack of devices, and occasional technical problems.'
Suggested school/teacher support	Guidance, demonstration, hands-on training, clearer instructions, better internet/computers	Learners suggested: 'guiding me', 'TEACHING ME', and 'providing reliable computers and internet access.'

Table 14 shows that the learners commonly used smartphones, computers, laptops, tablets, AutoCAD, Google-based tools, Canva, presentation applications, and productivity software in their TLE learning activities. The range of tools indicates that ICT use extended beyond basic communication and included searching for information, creating outputs, preparing designs, submitting requirements, and organizing schoolwork.

Smartphones or cellphones emerged as the most frequently mentioned devices. This is understandable because smartphones combine internet access, communication, photography, video recording, document viewing, and application use in a portable device. Learners can use smartphones to view demonstrations, search for procedures, photograph performance outputs, communicate with classmates, and access Google Classroom or similar platforms.

Computers, laptops, and tablets were also mentioned, particularly for tasks requiring larger screens, physical keyboards, desktop applications, and file preparation. AutoCAD and similar design tools indicate that some learners engaged with specialized software related to technical drawing or design. Canva and presentation tools suggest that learners also used ICT for the visual organization and presentation of outputs.

These findings correspond with UNESCO's emphasis on transforming TVET for digital and inclusive economies. Technical-vocational learners increasingly require both occupational competence and the ability to use digital tools relevant to learning and work. TESDA's national plan similarly identifies smart, innovative, and future-ready skills as priorities for Philippine TVET.

The learners' references to "PHONE," "Laptop, smartphones, and tablet," and "Google Classroom, Gmail, AutoCAD, Computer" illustrate a multimodal technology environment. However, the educational quality of ICT use depends on whether tools are aligned with learning competencies. A presentation application is useful when it helps learners organize and communicate ideas. A smartphone becomes an instructional tool when used for guided research, documentation, communication, and reflection.

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

The learners reported using ICT to complete tasks and projects, search for information, understand lessons, prepare presentations and reports, and complete activities more quickly. Statements such as “TO DO SOME TASK OR ACTIVITIES THAT ARE ASSIGNED TO US” and “Because it helps me to make the activity faster” suggest that learners valued ICT for efficiency and task completion.

Efficiency is a valid benefit, but faster task completion should not become the only criterion for successful ICT use. Technology should also deepen understanding, promote originality, improve decision-making, and support the transfer of knowledge to practical activities. Effective vocational education connects academic knowledge with practical skills and workforce requirements, while digital integration should support meaningful and authentic competencies. The open-ended responses also support the favorable perceptions previously reported by learners. ICT enables access to multiple explanations and demonstrations, which may be valuable when learners need to review procedures outside class. Nevertheless, teachers should verify the accuracy, safety, and curricular relevance of recommended online materials.

Unstable or slow internet connectivity was the most prominent difficulty, reflected in statements such as “poor internet connection,” “No WiFi Connection,” and “Slow internet connection, lack of devices, and occasional technical problems.” Device limitations and software difficulties were also reported.

Connectivity problems can interrupt video streaming, downloading, online collaboration, and assignment submission. Limited devices may require learners to share technology with family members or complete tasks within restricted schedules. Software problems may include compatibility issues, limited storage, outdated devices, restricted licenses, or insufficient familiarity with specialized applications.

These responses help explain why high ICT utilization may not have resulted in significant relationships with TLE performance. Learners may report frequent use but still experience interruptions, unequal access, or difficulty applying tools effectively. Technology access must therefore be understood in terms of reliability, affordability, usability, availability, and instructional suitability.

The findings support the use of offline resources, compressed demonstration videos, downloadable materials, printed alternatives, flexible submission schedules, shared-device options, and scheduled computer laboratory use. The school should also consider whether the digital tools required for TLE are compatible with learners’ available devices.

Learners recommended guidance, demonstrations, hands-on training, clear instructions, reliable computers, and improved internet access. Statements such as “guiding me,” “TEACHING ME,” and “providing reliable computers and internet access” show that learners did not regard ICT as a substitute for teachers. Instead, learners expected teachers to demonstrate appropriate tools, explain procedures, and provide support.

This finding aligns with research on vocational teachers’ technological pedagogical content knowledge. Istiningsih (2022) found that effective ICT integration in vocational education depends on teachers’ ability to combine technology, pedagogy, content knowledge, and assessment. The study recommended targeted ICT support and professional training to strengthen teachers’ preparation for digital vocational education.

The learner responses also support institutional strategies such as departmental learning sessions, peer coaching, ICT training, and targeted intervention for learners with weak performance. Existing TLE integrated intervention plans commonly identify remediation, suitable learning materials, teacher ICT capacity, and learner skills development as important areas of school-based improvement.

The open-ended results enrich the quantitative findings by showing that learners already use multiple devices and applications for academic purposes but encounter contextual and technical barriers. Learners value ICT because it helps them complete tasks, access information, understand lessons, and create outputs. At the same time, unstable connectivity, limited devices, software difficulties, and insufficient guidance may reduce the educational benefits of ICT.

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

Therefore, the proposed intervention should not merely increase technology use. It should improve the quality, reliability, accessibility, and instructional relevance of ICT use. Teacher demonstrations, hands-on training, offline materials, clearer instructions, laboratory access, digital literacy lessons, and continuous feedback should form central components of the integrated intervention plan.

CONCLUSIONS AND RECOMMENDATIONS

Summary of Findings

Summary of the Study

This study determined learners' ICT utilization and examined its relationship with their First-Term learning performance in TLE–Family and Consumer Science at Bulacao National High School during School Year 2026–2027. Specifically, it described ICT utilization in terms of frequency of access, purpose of utilization, and types of ICT tools deployed; examined Home Digital Access, Responsible ICT Use, and Learners' Perception of ICT; described learning performance in terms of Written Outputs and Performance Tasks; tested the relationship between overall ICT utilization and the two performance components; analyzed learners' open-ended responses; and used the findings as the basis for an ICT-integrated instructional intervention.

The study employed a quantitative descriptive-correlational design. The respondents were 100 Grade 10 TLE learners. Data were gathered using a learner ICT use questionnaire and documentary analysis of TLE performance records. The statistical tools used were frequency and percentage, weighted mean, standard deviation, and Pearson Product-Moment Correlation.

Findings

The findings revealed that the learners' overall ICT utilization was interpreted as High Extent, with a grand weighted mean of 3.73 and a standard deviation of 1.12. Among the three dimensions, Purpose of ICT Utilization registered the highest weighted mean (3.81), followed by Types of ICT Tools Deployed (3.76) and Frequency of ICT Access (3.64).

The learners also generally agreed that their home digital access supports TLE learning (WM = 3.77, SD = 1.08), that they use ICT responsibly (WM = 3.81, SD = 1.05), and that ICT is helpful in TLE learning (WM = 3.93, SD = 0.96).

For TLE learning performance, Written Outputs obtained a mean of 75.81, interpreted as Fairly Satisfactory, while Performance Tasks obtained a higher weighted mean of 88.75, interpreted as Very Satisfactory. The Composite TLE Performance obtained a weighted mean of 82.28, interpreted as Satisfactory.

The Pearson correlation analysis showed that ICT use was not significantly related to Written Outputs ($r = -0.044$, $p = 0.661$) and Performance Tasks ($r = -0.082$, $p = 0.418$). Thus, the null hypotheses stating that overall ICT utilization was not significantly related to Written Outputs or Performance Tasks were not rejected.

The open-ended responses showed that learners most often used smartphones, computers, AutoCAD, Google, Canva, and productivity software for TLE. They used ICT mainly to complete tasks, search for information, understand lessons, and prepare outputs. However, learners identified unstable internet connection, limited devices, and software difficulties as major problems. They suggested that teachers and the school provide more guidance, demonstrations, hands-on training, reliable computers, and better internet access.

Conclusions

Based on the findings of the study, it is concluded that learners use Information and Communication Technology in TLE to a great extent, particularly for understanding lessons, searching for information, creating written and digital outputs, documenting performance tasks, and improving the quality of TLE-related requirements. Learners also generally have favorable home digital access, demonstrate responsible ICT use, and perceive technology as

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

helpful in strengthening creativity, communication, collaboration, and their overall learning experience. These results indicate that ICT is already an important part of learners' TLE activities and provides useful opportunities for accessing information and completing academic and practical requirements.

The study further concludes that learners perform better in Performance Tasks than in Written Outputs. This suggests that learners demonstrate greater competence in hands-on, practical, and application-based activities than in written academic requirements. While the satisfactory overall TLE performance indicates that learners generally meet the expected competencies, the lower performance in Written Outputs points to a need for additional support in reading comprehension, technical vocabulary, research, organization of ideas, procedure writing, reflection, and project documentation. TLE instruction should therefore sustain learners' strengths in practical activities while strengthening the written competencies needed for academic learning and future technical or vocational work.

Despite the learners' great extent of ICT utilization and favorable perceptions of digital tools, the study found no significant relationship between ICT use and either Written Outputs or Performance Tasks. The findings therefore demonstrate that the extent of ICT use alone does not determine academic achievement. This conclusion is consistent with research showing that the relationship between technology use and learning performance depends on the purpose, intensity, instructional context, and quality of technology integration rather than on frequency of use alone (Valverde-Berrocoso et al., 2022; Xiong et al., 2025).

The study also concludes that teacher guidance is a critical condition in translating ICT utilization into meaningful learning outcomes. Teachers determine how digital tools are connected to learning competencies, written requirements, practical activities, and assessment standards. Through structured instructions, demonstrations, guided research, writing templates, hands-on practice, feedback, and monitoring, teachers can help learners transform digital information into original and technically accurate outputs. Effective ICT integration therefore requires teachers who possess the necessary digital, pedagogical, and content-related competencies to select appropriate tools and adapt technology-based activities to learners' needs (Domínguez-González et al., 2025; UNESCO, 2018).

Finally, unstable internet connectivity, limited access to devices, technical difficulties, and insufficient hands-on ICT training remain important barriers to effective technology use. The findings and learner responses emphasize the instructional importance of teacher guidance in helping learners use ICT purposefully. Accordingly, ICT should be treated as an instructional support rather than as a factor that, by itself, determines learners' achievement. Its effectiveness depends on equitable access, responsible use, reliable infrastructure, appropriate digital tools, teacher competence, authentic practice, and timely feedback. Overall, meaningful improvement in TLE performance can be achieved when ICT is purposefully integrated with structured writing support, practical application, responsible digital behavior, and continuous teacher guidance.

Recommendations

Based on the findings and conclusions of the study, the following recommendations are offered:

1. **TLE Teachers.** TLE teachers should integrate structured and guided ICT activities into Family and Consumer Science instruction to improve learners' Written Outputs while sustaining their performance in practical tasks. Digital tools may be used for recipe costing, household budgeting, meal planning, nutrition activities, product presentation, food-safety demonstrations, clothing and textile design, entrepreneurship, and documentation of practical outputs. Teachers should provide clear templates, rubrics, demonstrations, supervised practice, and timely feedback while guiding learners in evaluating online information, acknowledging sources, and producing original work.
2. **School Administrators and ICT Coordinators.** School administrators and ICT coordinators should support implementation through functional devices, reliable connectivity, offline resources, laboratory access, equipment maintenance, and teacher training.

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

3. **Parents and Guardians.** Parents and guardians should monitor the responsible academic use of ICT at home.
4. **Learners.** Learners should use technology purposefully for research, planning, communication, practice, reflection, and output preparation.
5. **Future Researchers.** Future researchers may evaluate specific ICT-integrated interventions and examine other factors affecting learners' Written Outputs and Performance Tasks.

Output of the Study: ICT-Integrated Instructional Intervention Plan

This section presents the output of the study based on the findings on learners' use of Information and Communication Technology (ICT) and their learning performance in Technology and Livelihood Education (TLE). The results showed that learners used ICT to a great extent and generally viewed ICT as useful in TLE; however, correlation results indicated that Overall ICT utilization was not significantly related to learners' Written Outputs or Performance Tasks. Hence, the output of the study is an ICT-integrated intervention plan designed to make learners' ICT use more guided, purposeful, responsible, and aligned with TLE learning competencies.

The integrated intervention plan responds to the major findings of the study: learners performed better in Performance Tasks than in Written Outputs; overall ICT utilization was high but was not significantly related to either performance component; learners reported internet- and device-related barriers; and learners requested greater teacher guidance, demonstrations, hands-on training, and clearer instructions in using ICT for TLE tasks.

Rationale

TLE is both knowledge-based and performance-based. While ICT can support learners in searching for information, watching demonstrations, preparing outputs, and documenting tasks, the results of the study suggest that technology use must be intentionally connected to instruction, practice, feedback, and assessment. The proposed integrated intervention plan therefore focuses on improving Written Outputs, sustaining strong Performance Tasks, strengthening responsible ICT use, addressing access barriers, and developing learners' competence in using digital tools for TLE.

General Objective

The general objective of the integrated intervention plan is to optimize learners' TLE performance and digital literacy by integrating ICT into guided, skill-based, responsible, and output-oriented learning activities.

Specific Objectives

1. Improve learners' Written Outputs through structured templates, guided writing, feedback, and revision activities.
2. Strengthen learners' Performance Tasks through ICT-supported demonstrations, tutorials, simulations, and hands-on practice.
3. Develop responsible and productive ICT use among learners in TLE.
4. Address common ICT barriers such as unstable internet connection, limited devices, and low confidence in using digital tools.
5. Provide teachers with a practical plan for integrating ICT into TLE instruction and assessment.

Scheme of Implementation

The integrated intervention plan shall be implemented by the TLE teachers with the support of the ICT coordinator, school administrators, parents or guardians, and other stakeholders. Implementation may begin at the start of a grading period and may continue throughout the school year. The plan may be adjusted depending on available resources, class schedules, learners' needs, and school priorities.

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24305907

Monitoring and Evaluation

Monitoring shall be done every grading period through review of Written Outputs, Performance Tasks, ICT-based outputs, learner feedback, and teacher observation notes. Evaluation shall focus on whether learners demonstrate improvement in written work, responsible ICT use, confidence in using digital tools, and completion of performance-based requirements. The Actual Accomplishment column shall be filled in after implementation to document progress, challenges, and needed adjustments.

Expected Output

The expected output of the study is a contextualized ICT-integrated intervention plan for TLE that can guide the school and TLE teachers in improving learners' written outputs, sustaining performance task achievement, promoting responsible ICT use, and addressing ICT access barriers. The plan is intended to convert learners' existing ICT use into more meaningful, guided, and instructionally relevant learning practic

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages [to be assigned]
ISSN: 3155-7546 (Online)
DOI: [to be assigned]

Integrated Instructional Intervention Plan

AREAS OF CONCERN	OBJECTIVES	STRATEGIES	PERSONS INVOLVED	BUDGET	SOURCE OF BUDGET	TIME FRAME	EXPECTED OUTCOME	ACTUAL ACCOMPLISHMENT	REMARKS
Written Outputs in TLE	Improve learners' written outputs, especially reports, worksheets, reflections, and project documentation.	• Provide guided writing templates. • Use rubrics before submission. • Conduct peer review and teacher feedback. • Allow revision of written outputs.	TLE Teachers, Learners, English/ Reading Teachers	PHP 2,000	School MOOE / TLE Department Funds	8 Weeks	Improved organization, completeness, clarity, and quality of written outputs.		
Performance Tasks in TLE	Sustain and improve learners' performance in practical and hands-on TLE activities.	• Use video demonstrations and step-by-step guides. • Conduct teacher-led demonstrations • Provide guided practice before final performance. • Use performance rubrics.	TLE Teachers, Learners, ICT Coordinator	PHP 3,000	School MOOE / TLE Laboratory Funds	8 Weeks	Maintained or improved performance task scores and better quality of practical outputs.		
ICT Skills and Digital Tool Competence	Develop learners' ability to use ICT tools for TLE activities and outputs.	• Conduct mini-workshops on Google Docs, MS Word, PowerPoint, Canva, spreadsheets, and TLE-related applications. • Provide short practice activities. • Create quick reference guides.	TLE Teachers, ICT Coordinator, Learners	PHP 4,000	School MOOE / ICT Support Funds	Every Term Period	Learners demonstrate improved confidence and correct use of ICT tools for TLE tasks.		
Responsible and Productive ICT Use	Strengthen responsible ICT behavior and reduce copying or misuse of online information.	• Teach source checking and proper citation. • Discuss responsible online communication. • Require learners to explain outputs in their own words. • Use originality and reflection checks.	TLE Teachers, ICT Coordinator, Class Advisers, Learners	PHP 1,500	School MOOE / Classroom Funds	Every Term Period	Learners submit more original, responsible, and properly guided ICT-based outputs.		

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages [to be assigned]
ISSN: 3155-7546 (Online)
DOI: [to be assigned]

Home Digital Access and Connectivity Support	Reduce the effect of unstable internet connection, limited devices, and access barriers on TLE outputs.	• Provide offline digital copies of lessons. • Schedule laboratory access. • Allow shared-device arrangements • Prepare printed alternatives for learners with limited access.	School Head, TLE Teachers, ICT Coordinator, Parents/Guardians	PHP 5,000	School MOOE / Stakeholder Support	Year-round	Reduced missed or delayed outputs due to device or internet problems.		
Teacher Guidance and ICT-Integrated Instruction	Improve teacher facilitation of ICT use in TLE lessons and assessments.	• Prepare ICT-integrated lesson exemplars. • Use blended demonstrations. • Provide clear instructions and checklists. • Monitor learners during ICT-based tasks.	TLE Department Head, TLE Teachers, ICT Coordinator	PHP 3,000	School MOOE / Department Funds	Every Term Period	Teachers implement more guided, structured, and competency-based ICT-integrated TLE activities.		
Monitoring and Evaluation	Track the implementation and effectiveness of the ICT-integrated intervention plan.	• Conduct pre- and post-review of written outputs. • Monitor performance task completion. • Gather learner feedback. • Review output quality every term period.	School Head, TLE Department Head, TLE Teachers, Researcher	PHP 1,500	School MOOE / Research Funds	Every Term Period	Documented progress in learner outputs, ICT skills, and TLE performance indicators.		

© 2026 Advancing SDG Impact.
All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: [to be assigned]

ACKNOWLEDGMENT

The researcher expresses sincere gratitude to everyone who contributed to the successful completion of this thesis.

First and foremost, the researcher gives all glory and thanksgiving to Almighty God for the wisdom, strength, patience, and perseverance provided throughout this academic journey.

Profound appreciation is extended to Dr. Nolasco K. Malabago, Chairman of the Thesis Advisory Committee, and the distinguished panel members, Dr. Perla N. Tenerife, Dr. Rufino T. Tudlasan Jr., Dr. Remegio M. Bergamo Jr., Dr. Rebecca DC. Manalastas, Dr. Reylan C. Capuno, and Dr. Ma. Angelica M. Lauronilla, for their valuable comments, scholarly insights, and constructive recommendations that enhanced the quality of the manuscript.

Deepest gratitude is also extended to the thesis adviser, Dr. Liberato A. Lauronilla, for the continuous guidance, patience, encouragement, and expertise generously shared throughout the development of the study.

The researcher is sincerely grateful to Dr. Arnel R. Pepito, School Head of Bulacao National High School, for granting permission and providing support for the conduct of the research. Heartfelt appreciation is likewise extended to the teachers of Bulacao National High School, particularly the TLE teachers, for their assistance and cooperation during the data-gathering process.

Special thanks are given to the learner-respondents for their honest responses and active participation, which made the completion of this study possible.

Finally, the researcher acknowledges everyone who offered encouragement, prayers, knowledge, and assistance throughout this meaningful journey. May Almighty God bless and reward each of you abundantly.

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: [to be assigned]

REFERENCES

Abayari, L. C. (2025). Innovative technology skills of Technology and Livelihood Education teacher on the student engagement and performance. *International Journal of Multidisciplinary Research and Publications*. http://ijmrap.com/wp-content/uploads/2025/07/IJMRAP-V8N1P97Y25.pdf

Arroz, M. D., Añero, M. B., Loremia, V. Z., Rivas, R. A., Lapiz, G. C., & Marurillas, F. D. (2025). The role of teaching methods in facilitating skills diffusion in Technology and Livelihood Education: A study among Bachelor of Technology and Livelihood Education faculty. *Journal of Educational and Social Research*. https://doi.org/10.36941/jesr-2025-0102

Asian Development Bank. (2016). *Shaping the future of education with technology: Comparison of Korea and Singapore for ICT in education*. Development Asia. https://development.asia

Babu, A. (2025). Digital citizenship education for school students. *International Journal of Research Publication and Reviews*, *6*(3), 7942–7944.

Calma, B. N. (2024). Facilitating learning and academic performance of learners in TLE under K to 12 curriculum: Basis for teaching strategies for TLE learners. *International Journal of Advanced Multidisciplinary Studies*.

The 1987 Constitution of the Republic of the Philippines, Article XIV. https://elibrary.judiciary.gov.ph/thebookshelf/showdocs/45/25572

Council of Europe. (2023). *Digital citizenship education handbook: Being online, well-being online, rights online*. Council of Europe Education Department.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, *13*(3), 319–340. https://doi.org/10.2307/249008

Department of Education. (2015). *DepEd Order No. 8, s. 2015: Policy guidelines on classroom assessment for the K to 12 Basic Education Program*. https://www.deped.gov.ph/2015/04/01/do-8-s-2015-policy-guidelines-on-classroom-assessment-for-the-k-to-12-basic-education-program/

Department of Education. (2016). *K to 12 curriculum guide: Edukasyong Pantahanan at Pangkabuhayan and Technology and Livelihood Education, Grade 4 to Grade 6, Grade 1 to Grade 10*. https://deped.gov.ph/wp-content/uploads/2019/01/EPP-CG.pdf

Department of Education. (2022, May 10). *DepEd highlights Digital Rise Program as key player in addressing challenges in education quality*. https://www.deped.gov.ph/2022/05/10/deped-highlights-digital-rise-program-as-key-player-in-addressing-challenges-in-education-quality/

Department of Education. (2023). *DepEd Order No. 016, s. 2023: Revised guidelines on the implementation of the Department of Education Computerization Program*. https://deped.gov.ph/2023/07/19/july-18-2023-do-016-s-2023-revised-guidelines-on-the-implementation-of-the-department-of-education-computerization-program/

Department of Education. (2023). *MATATAG K to 10 curriculum of the K to 12 program: Edukasyong Pantahanan at Pangkabuhayan/Technology and Livelihood Education, Grades 4–10*. https://matatagcurriculum.com/wp-content/uploads/2024/11/MATATAG-Curriculum-4-10-EPP-TLE.pdf

Department of Education. (2024, July 23). *DepEd Order No. 010, s. 2024: Policy guidelines on the implementation of the MATATAG Curriculum*. https://www.deped.gov.ph/2024/07/23/july-23-2024-do-010-s-2024-policy-guidelines-on-the-implementation-of-the-matatag-curriculum/

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: [to be assigned]

Department of Education. (2026, April 16). *DepEd Order No. 009, s. 2026: Guidelines on the implementation of the three-term school calendar in basic education*. https://www.deped.gov.ph/2026/04/16/april-16-2026-do-009-s-2026-guidelines-on-the-implementation-of-the-three-term-school-calendar-in-basic-education/

Department of Education. (2026, June 4). *DepEd Order No. 015, s. 2026: Revised guidelines on classroom assessment, grading system, and awards and recognition for the K to 12 Basic Education Program*. https://www.deped.gov.ph/2026/06/04/june-4-2026-do-015-s-2026-revised-guidelines-on-classroom-assessment-grading-system-and-awards-and-recognition-for-the-k-to-12-basic-education-program/

Espinosa, A. A., Gomez, M. A. C., Miranda, P. A., David, A. P., Abulon, E. L. R., Hermosisima, M. V. C., Quinosa, E. A., Jr., Soliman, A. A., De Vera, J. L., Claros, I. H. A., Cruz, H. G. M., & Gonzales, N. S. (2023). *Technology in education: A case study on the Philippines*. UNESCO. https://doi.org/10.54676/XKHI4627

Espinosa, A. A., Gomez, M. A. C., Miranda, P. A., David, A. P., Abulon, E. L. R., Hermosisima, M. V. C., Quinosa, E. A. Jr., Soliman, A. A., De Vera, J. L., Claros, I. H. A., Cruz, H. G. M., & Gonzales, N. S. J. (2025). Bridging a digital divide: A critical analysis of contextual factors affecting ICT integration in Philippine schools. *Issues in Educational Research, 35*(2), 526–549.

Ferrari, A. (2013). *DIGCOMP: A framework for developing and understanding digital competence in Europe* (Y. Punie & B. N. Brečko, Eds.). Publications Office of the European Union. https://doi.org/10.2788/52966

Fiş Erümit, S., & Keleş, E. (2023). Examining computer science education of Asia-Pacific countries successful in the PISA. *Journal of Educational Technology and Online Learning, 6*(2), 435–451.

Fraillon, J., Ainley, J., Schulz, W., Friedman, T., & Duckworth, D. (2014). *Preparing for life in a digital age: The IEA International Computer and Information Literacy Study international report*. Springer.

Fraillon, J., Rozman, M., Duckworth, D., et al. (2025). *An international perspective on digital literacy: Results from ICILS 2023*. International Association for the Evaluation of Educational Achievement.

Fuchs, K. (2022). Using an extended technology acceptance model to determine students' behavioral intentions toward smartphone technology in the classroom. *Frontiers in Education, 7*, Article 972338. https://doi.org/10.3389/feduc.2022.972338

Ibrahim, A., & Shiring, E. (2022). The relationship between educators' attitudes, perceived usefulness, and perceived ease of use of instructional and web-based technologies: Implications from Technology Acceptance Model. *International Journal of Technology in Education, 5*(4), 535–551. https://doi.org/10.46328/ijte.285

International Association for the Evaluation of Educational Achievement. (2024). *ICILS 2023 international results*. https://www.iea.nl

Juttukonda, L., Prusty, R., Avvaru, R., & Narayana, R. (2025). Perceptions of student-teachers towards their teaching learning environment. *Creative Education, 16*, 726–747. https://doi.org/10.4236/ce.2025.166044

Kaysi, F. (2025). Investigating the impact of simulation software on students' learning processes. *International Journal of Technology in Education and Science, 9*(1), 35–53. https://doi.org/10.46328/ijtes.606

Kilag, O. K. T., Miñoza, J. R., Comighud, E. S., Amontos, C. A., Damos, M. C., & Abendan, C. F. K. (2024). *Empowering teachers: Integrating technology into livelihood education for a digital future*. Zenodo. https://doi.org/10.5281/zenodo.11117540

Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice Hall.

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: [to be assigned]

Labor, M. J. C., Villa, M. C., & Gozon-Taglucop, P. S. (2025). Level of perception and academic performance in Technology and Livelihood Education among Grade 7 students of Saint Paul University Surigao. *European Journal of Theoretical and Applied Sciences, 3*(2). https://doi.org/10.59324/ejtas.2025.3(2).27

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge University Press. https://doi.org/10.1017/CBO9780511815355

Lita, J. E., & Briones, E. O. (2025). Interplay among learning environment, student engagement, and academic performance of Technology and Livelihood Education students. *International Journal of Research Publication and Reviews, 6*(6), 193–209. https://doi.org/10.55248/gengpi.6.0625.2004

Mbambo, G. P., & Du Plessis, E. C. (2025). Evaluating technical vocational education and training college student's digital skills versus throughput rate. *Discover Education, 4*, Article 6. https://doi.org/10.1007/s44217-025-00396-8

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record, 108*(6), 1017–1054. https://doi.org/10.1111/j.1467-9620.2006.00684.x

Norris, P. (2001). *Digital divide: Civic engagement, information poverty, and the Internet worldwide*. Cambridge University Press. https://doi.org/10.1017/CBO9781139164887

Organisation for Economic Co-operation and Development. (2023). *PISA 2022 results, Volume II: Learning during and after crises*. OECD Publishing. https://doi.org/10.1787/a97db61c-en

Pearce, A. (2022). The perceptions of students and teachers when using ICTs for educational practices matter: A systematic review. *Advances in Science, Technology and Engineering Systems Journal, 7*(6), 1–12.

Philippine Statistics Authority. (2025). *2024 National Information and Communications Technology Household Survey*. https://psa.gov.ph

Philippine Statistics Authority. (2025, July 21). *Percentage of households with internet connection increased to 48.8 percent in 2024; Two in every three individuals aged 10 years and over used the internet*. https://psa.gov.ph/statistics/nicths/node/1684077807

Republic Act No. 10173. (2012). *Data Privacy Act of 2012*. National Privacy Commission. https://privacy.gov.ph/data-privacy-act/

Republic Act No. 10533. (2013). *Enhanced Basic Education Act of 2013*. https://lawphil.net/statutes/repacts/ra2013/ra_10533_2013.html

Republic Act No. 10844. (2016). *Department of Information and Communications Technology Act of 2015*. https://lawphil.net/statutes/repacts/ra2016/ra_10844_2016.html

Rodriguez, C. F., & Habla, F. A. (2024). Learning continuity in Technology and Livelihood Education instruction through Information and Communication Technology integration. *UIJRT*. https://uijrt.com/articles/v5/i4/UIJRTV5I40005.pdf

Siemens, G. (2005). Connectivism: A learning theory for the digital age. *International Journal of Instructional Technology and Distance Learning, 2*(1). http://www.itdl.org/Journal/Jan_05/article01.htm

So, H.-J. (2016). *Shaping the future of education with technology: Comparison of Korea and Singapore for ICT in education* [Paper presentation]. Asian Development Bank Knowledge Events, Manila, Philippines.

© 2026 Advancing SDG Impact. All rights reserved.

Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: [to be assigned]

State Educational Technology Directors Association. (2025). *The universal connectivity imperative: Sustaining progress to close the digital access divide in K–12 education*. SETDA.

Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science, 12*(2), 257–285. https://doi.org/10.1016/0364-0213(88)90023-7

Tayaban, A. D. (2022). Students' and teachers' perspectives on ICT integration in the learning process during the pandemic. *International Journal of Multidisciplinary: Applied Business and Education Research, 3*(12).

UNESCO. (2021). *UNESCO strategy on technological innovation in education (2022–2025)*. UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000378847

UNESCO. (2023). *Technology in education: A tool on whose terms? Global Education Monitoring Report 2023*. UNESCO. https://www.unesco.org/gem-report/en/publication/technology

UNESCO. (2023, October 18). *UNESCO's ICT competency framework for teachers*. https://www.unesco.org/en/digital-competencies-skills/ict-cft

UNESCO. (2023, November 20). *Transforming education with digital learning*. https://www.unesco.org/sdg4education2030/en/articles/transforming-education-digital-learning

UNESCO. (2025). *Digital learning can promote equity in low-resource contexts*. UNESCO.

UNESCO Institute for Information Technologies in Education. (2022). *Global research, policy and practices report: Advancing artificial intelligence-supported global digital citizenship education*. UNESCO IITE.

Valverde-Berrocoso, J., Acevedo-Borrega, J., & Cerezo-Pizarro, M. (2022). Educational technology and student performance: A systematic review. *Frontiers in Education, 7*, Article 916502. https://doi.org/10.3389/feduc.2022.916502

van Dijk, J. A. G. M. (2020). *The digital divide*. Polity Press.

Varga, M. N., & Napoles, M. A. R. (2025). Integrating instructional design and technology acceptance in self-learning modular education: A review of ICT-based approaches for TLE-ICT under the MATATAG Curriculum. *International Journal of Research and Innovation in Social Science*. https://doi.org/10.47772/IJRISS.2025.903SEDU0590

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly, 27*(3), 425–478. https://doi.org/10.2307/30036540

Wong, G. K. W., & Cheung, H. Y. (2020). Computational thinking education in Asian K–12 schooling: Policy, curriculum, and implementation. *Computers & Education, 150*, Article 103843.

World Bank. (2025, July 2). *Unlocking the Philippines' digital transformation by increasing internet connectivity*. World Bank Group. https://www.worldbank.org/en/results/2025/07/02/unlocking-the-philippines-digital-transformation-by-increasing-internet-connectivity/

Yindeemak, A., Pasmala, R., Chooppawa, P., Nammanee, M., Jantakoon, T., Wannapiroon, P., & Nilsook, P. (2026). Emerging trends in virtual simulation for education: A systematic review of technology–pedagogy alignment. *International Journal of Technology in Education and Science, 10*(2). https://doi.org/10.46328/ijtes.6779

© 2026 Advancing SDG Impact. All rights reserved.

JASDG
JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4407-4453
ISSN: 3155-7546 (Online)
DOI: [to be assigned]

Zou, Y., Kuek, F., Feng, W., & Cheng, X. (2025). Digital learning in the 21st century: Trends, challenges, and innovations in technology integration. *Frontiers in Education, 10*, Article 1562391. https://doi.org/10.3389/feduc.2025.1562391

© 2026 Advancing SDG Impact. All rights reserved.