International Journal of Sustainable and Integrated Studies
Volume 1, Issue 2 | ISSN: 3155-6361
DOI: https://doi.org/10.65339/ijsis.V1.I2.103

Challenges of Flexible Learning to Trainers and Trainees in Diploma Programs: Basis for Enhanced Learning Management System (LMS)

Elma E. Gajosta[1], Dr. Bashiruddin A. Ajihil[1], Jenny Rose E. Jimlani, LPT

[1]*Doctor of Education Major in Educational Management, Universidad de Zamboanga, Zamboanga City, Philippines*

[2]*Master of Business Administration, Universidad de Zamboanga, Zamboanga City, Philippines*

Email of Corresponding Author: eegajosta.fo9@gmail.com

Publication history:

Received: August 19, 2026 Accepted: September 19, 2026
Revised: September 17, 2026 Published: September 20, 2026

International Journal of Sustainable and Integrated Studies, Vol. 1, No. 2, pp. 459–473, September 2026.

Abstract

This study examined the instructional, technological, organizational, socio-economic, and psychological challenges encountered by trainers and trainees in implementing flexible learning in the diploma programs of Zamboanga Sibugay Polytechnic Institute (ZSPI), providing an empirical basis for an Enhanced Learning Management System (LMS). The study was anchored in the Technology Acceptance Model (TAM), Technological Pedagogical Content Knowledge (TPACK) Framework, Diffusion of Innovations (DOI) Theory, and Input-Process-Output (IPO) Model. A quantitative descriptive research design and total enumeration sampling were employed, involving 25 trainers and 100 trainees during Academic Year 2020–2021. Data were collected using a researcher-developed questionnaire with a Cronbach's alpha of 0.89 and analyzed using frequency, percentage, weighted mean, independent samples t-test, and one-way ANOVA at the 0.05 significance level. Trainers experienced a High overall level of challenges (WM = 3.51), particularly in combined distance and face-to-face learning (WM = 3.75) and organizational implementation (WM = 3.62), while trainees experienced Moderate overall challenges (WM = 3.15) across instructional, technological, socio-economic, and psychological dimensions. Trainer age did not significantly differentiate experienced challenges. Trainees' socio-economic status significantly differentiated online-learning ($p = .038$) and socio-economic challenges ($p = .045$), whereas distance from school and ICT device did not produce significant differences. The study recommends strengthening ICT infrastructure, technical and learner support, professional development, competency-based instruction, and LMS functionality. The study aligns with SDG 4 (Quality Education), SDG 8 (Decent Work and Economic Growth), SDG 9 (Industry, Innovation and Infrastructure), and SDG 10 (Reduced Inequalities). Its sustainability impact encompasses educational, technological, socio-economic, community, and institutional sustainability by supporting accessible, resilient, competency-based flexible TVET and sustained institutional improvement.

Keywords: Competency-Based Education, Enhanced Learning Management System, Flexible Learning, Institutional Support, Socio-Economic Challenges, Technical Vocational Education and Training, Technology Acceptance

1. Introduction

The rapid development of Information and Communication Technology (ICT) has transformed educational delivery by expanding access to learning and supporting flexible, learner-centered approaches. UNESCO (2023) emphasized the role of digital technology in promoting equitable, inclusive, and resilient education, while the Organization for Economic Co-operation and Development (OECD, 2023) noted that strong digital infrastructure and institutional preparedness strengthen educational continuity during disruptions. The COVID-19 pandemic accelerated this transformation, affecting almost 1.6 billion learners worldwide and compelling institutions to adopt online, blended, distance, and other alternative learning modalities (UNESCO, 2023). However, effective flexible learning depends not only on technology but also on instructional design, educator competence, institutional readiness, learner engagement, and support systems (Meng et al., 2024). This transition is particularly significant in Technical and Vocational Education and Training (TVET), where competency-based education requires both theoretical instruction and practical skills development. UNESCO (2023) emphasized that flexible TVET must accommodate practical competencies and workplace readiness, while the International Labour Organization (ILO, 2022) highlighted the need for flexible models that preserve competency standards while widening access. In the Philippines, TESDA Circular No. 062, s. 2020 authorized Technical Vocational Institutions to implement flexible learning according to institutional capability, trainer competence, learner readiness, and technological resources. Within this context, Zamboanga Sibugay Polytechnic Institute (ZSPI) adopted flexible learning in its competency-based diploma programs. Trainers and trainees consequently faced interconnected instructional, technological, organizational, socio-economic, and psychological challenges. The present study examines these challenges and uses the findings as the basis for an Enhanced Learning Management System (LMS) intended to strengthen instructional delivery, learner support, institutional responsiveness, and the effectiveness of competency-based flexible learning.

Digital transformation has shifted education from predominantly teacher-centered instruction toward flexible and technology-enhanced environments that encourage collaboration, critical thinking, creativity, problem-solving, and lifelong learning. The United Nations Educational, Scientific and Cultural Organization (UNESCO, 2023) associated technology integration with instructional quality, equitable access, and the development of competencies required in technology-driven societies (UNESCO, 2023). The Organization for Economic Co-operation and Development (OECD, 2023) similarly identified digital transformation as important to institutional resilience, innovation, and preparation for changing social and economic demands. UNESCO (2023) and the Organization for Economic Co-operation and Development (OECD, 2023) further stressed that digital technologies support inclusive and sustainable education and continuity during crises. Flexible learning increasingly incorporates digital technologies to support teaching and learning beyond conventional classroom settings. The integration of information and communication technologies into educational practices has expanded opportunities for technology-supported instruction and has prompted continued examination of their relationship with student learning outcomes (Valverde-Berrocoso et al., 2022). Nevertheless, successful transformation requires institutional readiness, sound instructional design, educator competence, learner support, and appropriate infrastructure (Meng et al., 2024). The COVID-19 pandemic intensified the adoption of flexible learning after educational closures affected almost 1.6 billion learners in more than 190 countries (UNESCO, 2023). Research on emergency remote instruction showed that effectiveness was shaped by institutional support, instructional design, educator readiness, learner engagement, technological infrastructure, and learner services (Meng et al., 2024). Importantly, emergency responses should not be equated with deliberately designed online education. Meng et al. (2024) characterized Emergency Remote Teaching (ERT) as a temporary instructional response to crisis rather than a fully planned online learning system. Post-pandemic flexible learning therefore requires sustainable systems rather than temporary technological solutions. UNESCO (2023) emphasized flexibility in the time, place, pace, and mode of learning, while Meng et al. (2024) linked sustained implementation with instructional quality, faculty development, learner engagement, institutional preparedness, and adequate technological resources. Effective instructional design, ongoing faculty development, learner engagement, institutional preparation and sufficient technology resources are necessary for a successful flexible learning implementation, not only digital platforms alone, reported Meng et al. (2024). The shift also changed the responsibilities of educators and learners. Wohlfart and Wagner (2023) observed that educators had to redesign instructional materials, integrate technologies, adapt assessment, and provide continuing support. Learners, meanwhile, needed greater self-regulation, digital literacy, communication skills, and time management, although effective participation also depended on technological accessibility and institutional support (Meng et al., 2024).

Flexible learning presents distinctive challenges in TVET because competency-based programs require practical skills, occupational competence, and workplace readiness in addition to theoretical learning. UNESCO (2023) stressed that laboratory work, workshops, simulations, and industry-based activities require actual demonstrations of competence. The International Labour Organization (ILO, 2022) similarly emphasized maintaining competency standards while using appropriate technological innovations. Because practical competencies are difficult to reproduce completely in virtual environments, UNESCO (2023) advocated approaches combining technology-enhanced learning with supervised practical experiences. Flexible TVET may therefore incorporate

synchronous and asynchronous learning, blended instruction, modular approaches, simulations, virtual demonstrations, and face-to-face competency assessment (UNESCO, 2023). Its success nevertheless depends on instructional design, technological readiness, institutional support, educator competency, and learner engagement (Meng et al., 2024). Trainers must consequently adapt their instructional practices to technology-enhanced environments while maintaining appropriate pedagogical approaches and learner support. UNESCO (2023) likewise emphasized trainers' pedagogical knowledge and digital literacy. Learning Management Systems provide a central platform for organizing these activities. Cavus, Omonayajo, and Mutizwa (2022) identified LMS functions involving instructional resources, assessment, interaction, performance monitoring, and instructional organization. UNESCO (2023) associated well-designed digital platforms with equitable resource access and continuity, while Meng et al. (2024) emphasized engagement, feedback, collaboration, and evidence-based instructional decisions. LMS effectiveness, however, depends on institutional preparation, infrastructure, internet accessibility, digital competence, administrative support, instructional design, and technology acceptance (Cavus et al., 2022). Cavus et al. (2022) likewise associated successful LMS implementation with dependable infrastructure, professional development, technical assistance, and learner support. Equitable access to digital technologies also remains important to effective participation in flexible learning (UNESCO, 2023). Pedagogical capability is equally important. Educators experienced difficulty adapting materials, sustaining engagement, conducting authentic assessments, and providing feedback in technology-mediated instruction (Wohlfart & Wagner, 2023). Continuous professional development and institutional support therefore remain essential to digital pedagogy (Meng et al., 2024). Learner participation likewise depends on instructional quality, support, accessibility, motivation, and meaningful interaction (Meng et al., 2024). Continued LMS use is more likely when users perceive the system as useful, easy to use, reliable, and responsive (Cavus et al., 2022). Thus, LMS implementation requires the integration of technical, pedagogical, and organizational dimensions (Cavus et al., 2022) and continuing evaluation based on institutional needs and user experiences (Cavus et al., 2022).

Globally, flexible learning expanded rapidly as institutions sought educational continuity and resilience during disruption (UNESCO, 2023). Effective implementation requires more than technology because institutional preparation, instructional quality, learner support, and organizational adaptation influence educational resilience (Meng et al., 2024). In the Philippines, the Technical Education and Skills Development Authority (TESDA, 2022) institutionalized flexible learning in TVET. TESDA Circular No. 062, s. 2020 permits face-to-face, online, distance, and blended modalities according to institutional capability, trainer competence, learner readiness, and technological resources while maintaining competency-based standards. Republic Act No. 7796, or the Technical Education and Skills Development Act of 1994, provides the statutory basis for TESDA and its functions in technical education and skills development. This legal mandate continues to underpin contemporary TVET frameworks, including the Philippine TVET Trainer Qualifications Framework 2024 (TESDA, 2024). TESDA (2022) also expanded technology-enabled learning to improve access, particularly for geographically dispersed and marginalized learners. Despite national policy support, institutional implementation varies because of infrastructure, connectivity, finances, administrative support, trainer competence, and learner readiness. Ndibalema (2022) identified connectivity, device access, and institutional readiness as major Philippine barriers, while Meng et al. (2024) emphasized institutional preparation and learner support. Diploma programs require higher-level theoretical learning alongside competency-based practical training. UNESCO (2023) emphasized combining theoretical knowledge with workplace learning, while the International Labour Organization (ILO, 2022) associated flexible TVET with maintaining competency requirements while increasing educational access. At ZSPI, flexible learning required trainers to redesign instructional materials, integrate digital technologies into competency-based education, modify assessment, and sustain learner support. Similar educator difficulties in instructional redesign, engagement, and assessment were identified by Wohlfart and Wagner (2023), while Meng et al. (2024) emphasized institutional readiness, faculty development, and organizational support. Trainees also had to manage connectivity, device access, home-based learning, self-regulation, and digital literacy. Comparable technical and socio-economic constraints among Filipino learners were reported by Ndibalema (2022), with technology accessibility, instructional design, and institutional support influencing engagement (Meng et al., 2024). Consequently, flexible learning at ZSPI involves instructional, technological, organizational, socio-economic, and psychological concerns. Wohlfart and Wagner (2023) emphasized that such interconnected difficulties affect teaching effectiveness, learner engagement, and educational outcomes. An LMS may help address these concerns through integrated instructional delivery, communication, assessment, monitoring, and support. Cavus, Omonayajo, and Mutizwa (2022) emphasized that an effective LMS should support engagement, interaction, feedback, and evidence-based decision-making, while Meng et al. (2024) linked LMS value to instructional quality, institutional support, user acceptance, and continuing improvement. Although TESDA (2022) provides national guidance, implementation remains dependent on institutional conditions, geographical context, resources, learner characteristics, and organizational capacity. Institution-specific evidence is therefore necessary to understand how flexible learning policies operate in practice and how an Enhanced LMS can respond to ZSPI's particular needs.

The study integrates the Technology Acceptance Model (TAM), Technological Pedagogical Content Knowledge (TPACK) Framework, and Diffusion of Innovations (DOI) Theory to explain the technological, instructional, and organizational dimensions of flexible learning. Recent TAM research summarized by Cavus et al. (2022) explains technology adoption primarily through Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). Users are more likely to adopt technologies that improve performance and require less effort (Cavus et al., 2022). The model remains relevant to educational technology adoption (Cavus et al., 2022), particularly because perceived usefulness and ease of use influence the adoption of LMS and other flexible-learning technologies. Cavus et al. (2022) further showed that institutional conditions influence educators' acceptance of digital technologies. TAM also recognizes the importance of conditions surrounding technology use. Cavus et al. (2022) identified system quality, digital competency, and institutional support as relevant factors in educational technology adoption. Cavus et al. (2022) confirmed TAM's continuing applicability to online learning and LMS research, while Meng et al. (2024) emphasized meaningful engagement with digital tools. Likewise, Meng et al. (2024) associated favorable technology experiences with stronger engagement in online and blended environments. For trainers, TAM helps explain perceptions of LMS usefulness for planning, competency-based assessment, learner monitoring, and communication. Cavus et al. (2022) identified system quality, digital competency, and institutional support as relevant factors, while Wohlfart and Wagner (2023) highlighted professional development and institutional assistance. For trainees, technology acceptance can influence access to materials, task submission, online interaction, and communication. Meng et al. (2024) emphasized reliable tools and instructional support, while Meng et al. (2024) linked positive online-platform experiences with participation and continued use. TAM is particularly relevant to competency-based TVET because technology is increasingly integrated into instruction and assessment (UNESCO-UNEVOC, 2022). The International Labour Organization (2022) likewise emphasized developing trainers' and learners' digital competencies. Institutional support and appropriate technological conditions are also relevant to successful technology use (Cavus et al., 2022). According to Cavus et al. (2022), perceptions of usefulness and ease of use remain central, providing the basis for improving LMS accessibility and usability. The proposed Enhanced LMS is therefore consistent with Cavus et al. (2022), Cavus et al. (2022), and Meng et al. (2024). TAM alone does not fully explain how technology should be integrated with pedagogy and content. Cavus et al. (2022) primarily addressed technology acceptance, while Cavus et al. (2022) and Meng et al. (2024) indicate that effective flexible learning also depends on instructional design and pedagogy. The study therefore incorporates the TPACK Framework. Recent reviews describe TPACK as an integrated framework combining technological, pedagogical, and content knowledge (Schmid et al., 2024). TPACK consequently integrates Content Knowledge, Pedagogical Knowledge, and Technological Knowledge, together with their overlapping domains (Schmid et al., 2024). Schmid et al. (2024) identified TPACK as a widely used framework for examining teachers' technology-integration competence, while Schmid et al. (2024) emphasized balancing technological, pedagogical, and content knowledge in instructional decision-making. The framework is especially relevant to flexible and blended environments because successful teaching requires more than technological skill. Meng et al. (2024) linked effective flexible learning to instructional design and learner engagement. Schmid et al. (2024), Schmid et al. (2024), and Schmid et al. (2024) further support the importance of integrated technological, pedagogical, and content expertise. Wohlfart and Wagner (2023) likewise highlighted educators' need to redesign instruction and assessment in technology-enhanced environments. For TVET, TPACK supports the integration of digital technologies with competency-based teaching and practical skill development (UNESCO-UNEVOC, 2022). Schmid et al. (2024) therefore provide a basis for examining trainers' instructional and technological challenges, while Wohlfart and Wagner (2023) support the need for continuing instructional adaptation. The proposed Enhanced LMS is consistent with this integration of technology, pedagogy, and competency-based content (Schmid et al. (2024); Schmid et al. (2024)). Because TPACK concentrates primarily on instructional integration rather than institution-wide adoption, the study also uses Diffusion of Innovations Theory. Schmid et al. (2024) and Schmid et al. (2024) focus on instructional technology integration, whereas organizational adoption additionally requires leadership, communication, preparedness, and stakeholder support (OECD, 2023). Recent digital-education policy literature emphasizes that institutional innovation depends on communication, adoption, implementation, governance, and sustained organizational support (OECD, 2023). UNESCO (2023) similarly emphasized sustained institutional support, capacity development, and stakeholder participation. OECD (2023) further emphasizes coherent governance, infrastructure, stakeholder capacity, and institutional readiness as conditions for sustained digital transformation. Institutional leadership and organizational support influence educational innovation (OECD, 2023). OECD (2023) provides a basis for understanding adoption of educational technologies, while OECD (2023) emphasizes leadership, institutional preparedness, and communication. Flexible TVET similarly requires institutional changes in instruction and competency assessment (UNESCO-UNEVOC, 2022), and the International Labour Organization (2022) stresses organizational capacity for sustainable digital transformation. Applied to ZSPI, DOI explains how institutional policies, leadership, communication, technical support, professional development, and stakeholder participation affect flexible-learning implementation (OECD, 2023). Sustainable adoption is strengthened when innovations demonstrate benefits, respond to user needs, and receive organizational support (OECD, 2023). UNESCO (2023) further supports accessible technology, institutional commitment, and continuous capacity development. Taken together, TAM, TPACK, and DOI provide complementary explanations of flexible learning. Cavus et al. (2022) addresses trainers' and trainees' acceptance of educational technologies; Schmid et al. (2024) explain trainers'

integration of technology, pedagogy, and content; and OECD (2023) explains institutional adoption and sustainability. Their integration indicates that successful flexible learning depends on technological acceptance, instructional competence, and organizational support (OECD, 2023). The conceptual framework further uses the Input-Process-Output (IPO) Model. Inputs comprise trainer and trainee profiles and their instructional, technological, organizational, socio-economic, and psychological challenges. The process consists of systematic data collection, organization, statistical analysis, and interpretation. The output is the proposed Enhanced LMS designed to improve instructional delivery, learner support, institutional responsiveness, and flexible-learning implementation. Thus, the empirical assessment of trainer and trainee experiences provides the basis for developing an institutional intervention aligned with the integrated theoretical framework.

Despite extensive research on flexible learning, much of the literature concentrates on higher education and general online or blended learning. Meng et al. (2024) found that research during the COVID-19 period largely examined emergency remote teaching in universities, leaving competency-based TVET comparatively underexplored. Cavus, Omonayajo, and Mutizwa (2022) similarly observed that LMS studies often emphasize technology acceptance and system use in higher education rather than the instructional and organizational conditions of TVET institutions. Philippine research identifies connectivity, device access, technological limitations, and digital preparedness as persistent challenges. Ndibalema (2022) documented technical and socio-economic barriers among Filipino learners, while Wohlfart and Wagner (2023) identified educators' difficulties in redesigning instruction, maintaining engagement, and adapting assessment. However, these studies do not comprehensively examine the combined instructional, technological, organizational, socio-economic, and psychological challenges of competency-based diploma programs within the TESDA flexible-learning framework. A further gap concerns the integration of trainer and trainee experiences in improving institutional LMS platforms. Cavus, Omonayajo, and Mutizwa (2022) emphasized continuous LMS evaluation according to user experiences and institutional requirements, yet existing studies frequently examine technology adoption or learner satisfaction separately. Institution-specific evidence is therefore needed to determine how multiple implementation challenges interact and how these findings can inform data-driven LMS enhancement. Accordingly, the present study examines the instructional and technological and organizational challenges experienced by trainers and the instructional and technological, socio-economic, and psychological challenges experienced by trainees in ZSPI diploma programs. It also considers relevant respondent characteristics and differences in experienced challenges. The findings provide the empirical basis for proposing an Enhanced LMS intended to improve instructional delivery, learner support, institutional responsiveness, and competency-based flexible learning. The study is limited to selected trainers and trainees in ZSPI diploma programs during Academic Year 2020–2021 and covers online, blended, distance, and combined distance and face-to-face learning. It excludes other programs and institutions. The proposed Enhanced LMS is derived from the findings but is not implemented or evaluated within the scope of the study.

The study is most directly aligned with SDG 4 – Quality Education because it addresses accessibility, instructional quality, learner support, digital competence, and institutional capacity in flexible competency-based education. UNESCO (2023) identifies digital technology as important to equitable, inclusive, and resilient educational systems, while UNESCO (2023) emphasizes flexible learning approaches capable of meeting diverse learner needs without compromising educational quality. The proposed Enhanced LMS supports this orientation by seeking to improve access to learning resources, instructional interaction, competency-based assessment, communication, and learner monitoring. The research also relates to SDG 8 – Decent Work and Economic Growth through its TVET context. Competency-based diploma programs are intended to develop occupational competencies and workplace readiness, and the International Labour Organization (ILO, 2022) emphasizes resilient TVET systems that maintain competence standards while increasing educational access. The International Labour Organization (2022) further highlights digital competencies as increasingly important in preparing learners for technology-driven employment and lifelong learning. The technological and institutional dimensions of the study are also consistent with SDG 9 – Industry, Innovation and Infrastructure. Effective flexible learning depends on technological infrastructure, connectivity, accessible digital systems, and institutional innovation. Ndibalema (2022) identified connectivity and device limitations as barriers in the Philippine context, while UNESCO (2023) emphasized equitable access to digital technology. The Enhanced LMS represents an educational technology intervention intended to strengthen the infrastructure supporting competency-based flexible learning. Finally, the study has relevance to SDG 10 – Reduced Inequalities insofar as its documented socio-economic and technological challenges concern unequal access to connectivity, devices, and educational resources. UNESCO (2023) stressed that equitable access to digital technology is necessary to prevent flexible learning from reinforcing existing educational disparities. Addressing accessibility and learner-support constraints can therefore contribute to more inclusive participation in diploma education.

The study contributes principally to educational, technological, socio-economic, community, and institutional sustainability. Educational sustainability is addressed through the effort to maintain accessible, competency-based learning across flexible delivery modes while preserving instructional quality and practical skill development. UNESCO (2023) and Meng et al. (2024) emphasize that sustainable flexible learning requires the integration of

instructional design, educator competence, learner engagement, institutional preparedness, and technological resources. Technological sustainability is reflected in the need for an LMS that remains accessible, usable, responsive, and capable of supporting instructional resources, assessment, communication, monitoring, and learner assistance. Cavus, Omonayajo, and Mutizwa (2022) emphasize continual LMS evaluation according to user and institutional needs, while Cavus et al. (2022) show that technology adoption depends on the interaction of technical, pedagogical, and organizational conditions. Socio-economic sustainability is relevant because technological access and participation in flexible learning are affected by internet availability, devices, and financial capacity. Ndibalema (2022) identified these barriers among Filipino learners, demonstrating that technological innovation must be accompanied by equitable access and appropriate learner support. Institutional sustainability concerns ZSPI's capacity to maintain and continually improve flexible learning through appropriate policies, infrastructure, professional development, technical assistance, quality assurance, and evidence-based decision-making. The integrated theoretical perspective indicates that sustainable educational innovation requires technology acceptance (Cavus et al., 2022), effective integration of technology, pedagogy, and content (Schmid et al., 2024), and organizational adoption and continued support (OECD, 2023). The study also supports community and workforce sustainability through its focus on TVET. Flexible diploma education can extend opportunities for competency development while supporting industry-relevant skills and employability. UNESCO-UNEVOC (2022) and the International Labour Organization (2022) emphasize the importance of digital transformation and flexible TVET in preparing learners for evolving technology-driven workplaces. Overall, examining the experiences of both trainers and trainees provides an institution-specific basis for strengthening flexible learning. The proposed Enhanced LMS links instructional practice, technology, learner support, and institutional management, thereby contributing to a more accessible, resilient, competency-based, and sustainable TVET learning environment.

2. Material and methods

2.1 Research Design

The study used a quantitative descriptive research design to obtain objective numerical data on the challenges experienced by trainers and trainees in implementing flexible learning. The descriptive approach was appropriate because it enabled the researcher to describe existing conditions without manipulating the variables. As Creswell and Creswell (2023) points out, descriptive research is appropriate when the primary purpose is to determine and describe the qualities of a population or phenomenon using quantitative data collection and statistical analysis. A survey method using a researcher-developed questionnaire adapted from literature and theoretical frameworks on flexible learning and Learning Management Systems was employed to collect standardized data from the respondents. This approach facilitated consistent data collection and statistical comparisons between respondent groups. Frequency count, percentage, weighted mean, independent sample t-test and one way Analysis of Variance (ANOVA) were used to describe respondent profiles, determine the extent of challenges, and identify significant differences according to selected profile variables. The results provided the empirical basis for recommendations to enhance the institution's Learning Management System.

2.2 Locale of the Study

The study was conducted at Zamboanga Sibugay Polytechnic Institute (ZSPI), a public Technical Vocational Education and Training (TVET) institution in the Municipality of Kabasalan, Province of Zamboanga Sibugay, Philippines. The institution provides competency-based technical and skills development programs intended to prepare learners for employment, entrepreneurship, and lifelong learning and follows the standards and training requirements established by the Technical Education and Skills Development Authority (TESDA). During Academic Year 2020–2021, ZSPI offered eight TESDA-recognized diploma programs with more than 500 enrolled diploma students. Following disruptions caused by the COVID-19 pandemic, the institution adopted flexible learning in accordance with TESDA Circular No. 062, s. 2020, while maintaining competency-based training standards. Google Classroom served as the primary Learning Management System for distributing learning modules, submitting assignments, conducting assessments, providing announcements, and facilitating communication. The institution implemented online, blended, distance, and combined distance and face-to-face learning according to program competency requirements and learner circumstances. ZSPI also maintained ICT resources that supported flexible learning, including an ICT Learning Center, computer laboratories for Computer Systems Servicing (CSS NC II) programs, an e-learning laboratory in the library, and free wireless internet access provided by the Department of Information and Communications Technology (DICT). The institution was selected because of its implementation of flexible learning in diploma programs, established LMS, ICT infrastructure, TESDA-aligned learning modalities, and diverse trainer and trainee population. These conditions provided an appropriate setting for examining instructional, technological, organizational, socio-economic, and psychological challenges and for developing an Enhanced Learning Management System based on the findings.

2.3 Respondents of the Study

The respondents were trainers and trainees of Zamboanga Sibugay Polytechnic Institute who were directly involved in flexible learning during Academic Year 2020–2021. The institution offered eight TESDA-certified diploma programs with an estimated enrollment of 500 diploma students during the period. Eligible trainers were those actively teaching diploma programs and using flexible learning modalities during Academic Year 2020–2021. Eligible trainees were enrolled in diploma programs and actively participating in the flexible learning modalities implemented by the institution. Individuals who were not actively involved in flexible learning, were on leave, had completed their diploma programs, or did not satisfy the established inclusion criteria were excluded. The final respondents consisted of twenty-five (25) diploma trainers and one hundred (100) diploma trainees, for a total of one hundred twenty-five (125) participants. All 125 questionnaires distributed were completed and considered usable, resulting in a 100 percent response rate.

2.4 Sample and Sampling Procedure

The study employed total enumeration sampling because the accessible population of eligible trainers and trainees was manageable. All available respondents who satisfied the inclusion criteria were included. Total enumeration is ideal when the researcher intends to include the whole available population that satisfies the selection criteria so that the sampling error is minimized and the respondents are fully represented (Creswell & Creswell, 2023). Because the study sought information from the entire accessible population meeting the inclusion criteria, no sample-size determination formula was applied. Total enumeration reduced the need for sample estimation, minimized sampling bias, and improved representation by allowing all eligible trainers and trainees to participate. The resulting sample comprised twenty-five (25) trainers and one hundred (100) trainees.

2.5 Research Instrument

The primary data-gathering instrument was a researcher-made questionnaire developed according to the objectives and Statement of the Problem and informed by related literature and theoretical frameworks concerning flexible learning, educational technology, competency-based Technical Vocational Education and Training (TVET), and Learning Management Systems. The instrument collected the demographic and professional characteristics of trainers, including educational attainment, trainers' methodology (TM) level, ICT equipment access, internet availability, and age. For trainees, it covered academic year, socio-economic status, distance from school, ICT device access, internet availability, and ICT-related training. It also measured trainers' instructional and technological challenges across online, blended, distance, and combined distance and face-to-face learning, as well as organizational challenges. For trainees, it assessed instructional and technological challenges across flexible learning modalities together with socio-economic and psychological challenges. Questionnaire items were derived from the study variables and developed through a review and mapping of literature concerning flexible learning, Learning Management Systems (LMS), Technical Vocational Education and Training (TVET), and educational technology. The instrument was also grounded in the Technology Acceptance Model (TAM), Technological Pedagogical Content Knowledge (TPACK) Framework, and Diffusion of Innovations Theory. Content validity was established through review by specialists in educational management, research methodology, educational technology, technical-vocational education, and statistics. The validators evaluated the relevance, clarity, organization, language, and adequacy of the items and their consistency with the study objectives. They also examined the questionnaire's representation of the implementation criteria and components provided in TESDA Circular No. 062, s. 2021, and the TESDA Flexible Learning Delivery Framework. Revisions were made based on their evaluation. The questionnaire was pilot tested with thirty (30) respondents who possessed characteristics similar to those of the target participants but were excluded from the actual study. The pilot test assessed item clarity, consistency, reliability, and possible ambiguities. Reliability was determined using Cronbach's Alpha Coefficient, yielding a value of 0.89 and indicating strong internal consistency. The questionnaire was therefore considered reliable and appropriate for the study. Responses were scored using a five-point Likert scale, with descriptive interpretations used to determine the extent of the challenges experienced.

2.6 Data Gathering Procedure

Following approval of the research proposal by the research adviser and thesis committee, the researcher submitted an official request to the Office of the President and appropriate authorities of Zamboanga Sibugay Polytechnic Institute to conduct the study. After permission was obtained, the researcher coordinated with the relevant program directors and trainers regarding the survey schedule and administration. Before data collection, respondents were informed about the purpose of the research and their rights, and informed consent was secured. The researcher administered the questionnaire to the selected trainers and trainees based on the 2021 TESDA Flexible Learning Framework and related literature. Respondents were given adequate time to complete the questionnaire, while clarification of instructions was provided when necessary without influencing their responses. Completed questionnaires were reviewed for completeness and consistency before data encoding. Responses were then coded in Microsoft Excel and transferred to the appropriate statistical application for analysis. The resulting data were used to present, analyze, and interpret the findings and to formulate conclusions, recommendations, and proposed improvements to the Learning Management System.

2.7 Data Analysis Techniques

The collected data were analyzed using descriptive and inferential statistical techniques aligned with the research objectives. Frequency Count and Percentage were used to describe respondents according to age, educational attainment, Trainers Methodology Certification (TMC) level, socio-economic status, distance from school, ICT gadget availability, internet connectivity, academic year level, and ICT-related training. Weighted Mean was used to determine the extent of instructional and technical, organizational, socio-economic, and psychological challenges experienced by trainers and trainees. The resulting weighted means were interpreted using the descriptive scale adopted in the study. An Independent Samples t-Test was used to determine significant differences in the challenges experienced by trainees when grouped according to the dichotomous profile variables of socio-economic status and distance from school. A One-Way Analysis of Variance (ANOVA) was used to determine significant differences in the challenges experienced by trainers when grouped according to age. All hypotheses were tested at the 0.05 level of significance. A p-value less than or equal to 0.05 indicated a statistically significant difference and provided the basis for rejecting the null hypothesis, whereas a p-value greater than 0.05 indicated no statistically significant difference among the groups compared.

2.8 Ethical Considerations

The study observed the principles of respect for persons, beneficence, justice, confidentiality, and voluntary participation. Approval and authorization were obtained from the Research Adviser, Office of the President, and appropriate authorities of Zamboanga Sibugay Polytechnic Institute before administering the research instrument. Prospective participants were informed of the study's purpose and the voluntary nature of participation. They were advised that they could decline or withdraw without penalty or adverse consequences, and informed consent was obtained before participation. To preserve anonymity and confidentiality, the questionnaire did not collect personal identifiers such as names or identification numbers. Collected information was used exclusively for academic and research purposes, while completed questionnaires and electronic records were accessible only to the researcher and study adviser. The study observed the requirements of Republic Act No. 10173, or the Data Privacy Act of 2012, and its Implementing Rules and Regulations concerning the lawful collection, processing, storage, retention, confidentiality, and protection of personal information (National Privacy Commission [NPC], 2024). Findings were reported objectively without fabrication, falsification, or inappropriate manipulation of data. Sources, including TESDA Circular No. 062, s. 2021, literature, and previous research, were acknowledged and referenced to maintain research integrity and avoid plagiarism.

3. Results and Discussion

3.1 Profile of Trainers and Trainees

3.1.1 Profile of Trainees

Among the 100 trainees, 61% belonged to families earning less than Php120,000 annually, while 39% reported higher annual income. Fifty-five percent lived more than 10 kilometers from the institution and 45% lived within 10 kilometers. Most used Android smartphones (66%), while 34% used laptops or desktop computers. Almost all (99%) reported internet access. Most respondents were second-year students (98%), while 93% had attended one to three ICT-related training sessions. These findings indicate that although most trainees had basic internet access and ICT exposure, they differed substantially in economic circumstances, location, and available learning devices. These conditions indicate that flexible-learning readiness involves more than basic access to technology. Limited financial resources and reliance on smartphones may constrain participation in complex digital and competency-based activities. Ndibalema (2022) noted similar difficulties among low-income students, while Ndibalema (2022) identified unstable connectivity, limited digital-device access, and socio-economic constraints among Filipino students. UNESCO (2023) likewise identified socio-economic inequality as an obstacle to equitable digital education, while the International Labour Organization (2022) emphasized continuing digital-skills development in TVET. These conditions are also relevant to the Technology Acceptance Model (TAM) of Cavus et al. (2022), because access and economic circumstances may influence the perceived usefulness and ease of using educational technologies. The technical Pedagogical Content Knowledge (TPACK) Framework of Schmid et al. (2024) further emphasizes the interaction of technological resources, instructional design, and learner support.

3.1.2 Profile of Trainers

Among the 25 trainers, 80% held baccalaureate degrees, 8% had baccalaureate degrees with master's units, 8% held full master's degrees, and 4% had master's degrees with doctoral units. Most held Trainers Methodology Level 1 certification (88%), while 12% held Level 2. Nearly all used laptops or desktop computers (96%) and reported internet access (96%). The trainers represented different age groups, with 32% aged 21–30, 40% aged 31–45, and 28% aged 46–55. Most (84%) had attended one to three ICT-related training activities. The profile indicates that trainers generally possessed the academic preparation, competency-based training qualifications, and basic technological resources needed for flexible learning, although continuing professional development remained important. According to the Organization for Economic Co-operation and Development (OECD, 2023), educators with higher educational qualifications are generally more able to adapt instructional strategies, integrate digital technologies, and respond effectively to changing educational environments. Wohlfart and Wagner (2023)

similarly found that continuing professional development strengthened educators' confidence in redesigning instruction and using digital technologies. The Technical Education and Skills Development Authority (TESDA, 2022) emphasized the importance of Trainers Methodology certification for competency-based instruction, while UNESCO (2023) identified continuing professional development and digital competence as fundamental requirements for technology-enhanced teaching.

3.2 Challenges Encountered by Trainers

3.2.1 Online Learning Delivery

Trainers experienced Moderate instructional and technological challenges in online learning, with an overall weighted mean of 3.40. ICT equipment and ICT literacy/competencies/skills received the highest ratings at WM = 3.60, interpreted as High. Digital learning content and technical support each obtained WM = 3.48, while communication applications received the lowest rating at WM = 3.16 but remained Moderate. The findings indicate that trainers possessed basic technological resources and skills but continued to experience challenges involving instructional delivery, digital resources, assessment, connectivity, communication, and technical support. The findings show that online-learning effectiveness depends on more than technological availability. Meng et al. (2024) found that instructional design, learner engagement, institutional readiness, technological infrastructure, and educator support collectively influence online learning. Similarly, Meng et al. (2024) have shown that the continuity of education that online learning offers highly depends on the quality of instructional delivery, student involvement, assessment methodologies, and technical accessibility. The Technical Education and Skills Development Authority (TESDA, 2022) likewise emphasized technological resources, trainer competence, learner readiness, and institutional support. The results are consistent with the Technology Acceptance Model (TAM) as described by Cavus et al. (2022) and the technical Pedagogical Content Knowledge (TPACK) Framework presented by Schmid et al. (2024), indicating that technology acceptance must be accompanied by effective integration of technological, pedagogical, and content knowledge.

3.2.2 Blended Learning Delivery

Blended learning generated an overall weighted mean of 3.29, interpreted as Moderate. Technical support was the most prominent concern at WM = 3.52, followed by digitized learning materials at WM = 3.48 and ICT equipment at WM = 3.44. Online learning infrastructure for accessing digital and shared resources had the lowest rating at WM = 3.04. Thus, trainers were generally able to conduct blended learning but continued to experience challenges integrating classroom and digital activities, managing instructional resources, providing technical support, and conducting competency-based assessment. The findings indicate that blended learning requires coordinated pedagogical and technological support. Ashraf et al. (2022) observed that blended learning provides instructional flexibility but requires technological competence, instructional planning, and the ability to facilitate interaction across physical and virtual environments. Meng et al. (2024) similarly emphasized instructional design, learner engagement, institutional support, digital resources, and technological infrastructure, while TESDA (2022) stressed sufficient resources and competency-based instructional practices. The findings are also consistent with the Technological Pedagogical Content Knowledge (TPACK) Framework suggested by Schmid et al. (2024) and the Technology adoption Model (TAM) proposed by Cavus et al. (2022), showing that continued professional development, institutional support, and LMS functionality are important to successful blended-learning implementation.

3.2.3 Distance Learning Delivery

Distance learning challenges were Moderate overall, with a weighted mean of 3.47. Printed learning resources received the highest rating at WM = 3.60, followed by trainer–trainee communication at WM = 3.52, both interpreted as High. Assessment received WM = 3.48, audio-visual learning resources WM = 3.40, and technical support WM = 3.36. The results identify accessible instructional materials and sustained communication as the major difficulties experienced by trainers. Distance learning therefore depends strongly on instructional-material quality, communication, learner support, and institutional preparedness. Ndibalema (2022) emphasized learner independence, meaningful communication, continuing guidance, and flexible learning pathways. Meng et al. (2024) likewise identified well-designed instructional materials, engagement, technological infrastructure, and sustained institutional support, while TESDA (2022) emphasized accessible resources, competency-based assessment, and instructional and technical assistance. The findings can also be interpreted through the Technology Acceptance Model (TAM) introduced by Cavus et al. (2022) and the technical Pedagogical Content Knowledge (TPACK) Framework of Schmid et al. (2024), demonstrating that technology use must be integrated with appropriate pedagogy, content, communication, and support.

3.2.4 Combined Distance and Face-to-Face Learning

The combination of distance and face-to-face learning produced an overall weighted mean of 3.75, interpreted as High. Printed learning resources presented the greatest challenge at WM = 3.88, followed by audio-visual resources at WM = 3.80, competency-based workshop facilities at WM = 3.76, technical support at WM = 3.75, and communication at WM = 3.60. The results indicate substantial difficulty in simultaneously preparing and coordinating remote instructional materials, practical activities, communication, and support across different

learning environments. The findings demonstrate that combined delivery requires coordinated instructional planning, competency-based pedagogy, technological resources, communication, and institutional support. UNESCO (2023) emphasized that flexible models combining digital and classroom learning require institutional policies, technological infrastructure, quality resources, and learner support. Meng et al. (2024) similarly identified instructional design, engagement, institutional readiness, and technological infrastructure as important to sustainable blended and hybrid learning, while TESDA (2022) emphasized competency-based standards across learning modalities. These results also support the Technological Pedagogical Content Knowledge (TPACK) Framework developed by Schmid et al. (2024) and the Technology Acceptance Model (TAM) (Cavus et al., 2022), indicating that technology adoption alone cannot ensure effective hybrid competency-based instruction.

3.2.5 Organizational Challenges

Trainers experienced High organizational challenges, with an overall weighted mean of 3.62. Compliance with monitoring, reporting, and audit requirements obtained the highest rating at WM = 3.80, followed by delivery of quality TVET programs at WM = 3.76. Updating the Competency-Based Curriculum and providing flexible learning options and resources each obtained WM = 3.72. Learning infrastructure and preparation of training plans received the lowest ratings at WM = 3.40, although both remained Moderate. The findings indicate that institutional accountability, curriculum responsiveness, quality assurance, administrative requirements, infrastructure, and organizational support were major concerns. These results indicate that effective flexible learning depends on institutional capacity as well as trainer competence. Wohlfart and Wagner (2023) identified leadership, faculty support, organizational readiness, infrastructure, and professional development as essential to sustained flexible learning. The Organization for Economic Co-operation and Development (OECD, 2023) similarly emphasized leadership, organizational support, professional learning, and responsive governance. TESDA (2022) requires administrative systems, competency-based curricula, faculty development, learner support, and quality assurance, while UNESCO (2023) emphasizes institutional policy and collaborative leadership. The results are also consistent with the Technology Acceptance Model (TAM) proposed by Cavus et al. (2022) and the Technological Pedagogical Content Knowledge (TPACK) Framework developed by Schmid et al. (2024) .

3.2.6 Overall Challenges of Trainers

Across all dimensions, trainers reported a High overall challenge level of WM = 3.51. The combination of distance and face-to-face learning recorded WM = 3.75, organizational challenges WM = 3.62, distance learning WM = 3.47, online learning WM = 3.40, and blended learning WM = 3.29. Thus, organizational and combined-mode challenges were more pronounced, whereas the other instructional and technological dimensions were Moderate. The findings indicate that flexible learning requires the interaction of instructional competence, technological preparedness, institutional leadership, learner support, and organizational capacity. Wohlfart and Wagner (2023) emphasized institutional leadership, professional development, technological infrastructure, and organizational preparation. Meng et al. (2024) similarly identified instructional design, engagement, institutional support, resources, and infrastructure, while TESDA (2022) stressed faculty development, learner support, technology, and quality assurance. The Organization for Economic Co-operation and Development (OECD, 2023) also associated sustainable digital transformation with leadership and responsive governance. These findings are consistent with the Technology Acceptance Model (TAM) (Cavus et al., 2022) and the technical Pedagogical Content Knowledge (TPACK) Framework presented by Schmid et al. (2024).

3.3 Challenges Encountered by Trainees

3.3.1 Online Learning Delivery

Trainees experienced Moderate online-learning challenges, with an overall weighted mean of 3.20. Access to digital content and shared resources had the highest rating at WM = 3.36, followed by online assessment at WM = 3.34 and communication applications at WM = 3.28. The LMS itself had the lowest rating at WM = 2.95 but remained Moderate. The results indicate persistent difficulties in accessing resources, communicating, completing assessments, maintaining connectivity, and effectively using educational technologies. The findings indicate that online learning depends on learner readiness, instructional quality, technological accessibility, and institutional support. Meng et al. (2024) emphasized engagement, instructional design, infrastructure, and institutional support. Meng et al. (2024) likewise identified connectivity, digital competence, motivation, interaction, and access to technology as challenges, while Ndibalema (2022) reported unreliable connectivity, restricted device access, and socio-economic difficulties among Filipino students. The findings are consistent with the Technology Acceptance Model (TAM) by Cavus et al. (2022) and the Technological Pedagogical Content Knowledge (TPACK) Framework (Schmid et al., 2024), demonstrating that technology must be useful, accessible, and pedagogically integrated.

3.3.2 Blended Learning Delivery

Trainees experienced Moderate blended-learning challenges overall, with WM = 3.32. Competency-Based Curriculum requirements received the highest rating at WM = 3.71, followed by competency-based workshop requirements at WM = 3.56, both interpreted as High. Digital learning materials received the lowest rating at WM = 3.10. The findings indicate that trainees had greater difficulty integrating online theoretical learning with practical competency requirements than accessing digital instructional resources. The findings reinforce the need to integrate learner preparation, competency-based training, technology, and institutional support. Ashraf et al. (2022) emphasized self-regulation, communication, and managing learning across multiple environments, while Meng et al. (2024) identified learner engagement, instructional quality, infrastructure, and institutional support. Ndibalema (2022) similarly reported problems involving connectivity, digital resources, and technical preparation. The results are also consistent with the Technology Acceptance Model (TAM) (Cavus et al., 2022) and the Technological Pedagogical Content Knowledge (TPACK) Framework of Schmid et al. (2024).

3.3.3 Distance Learning Delivery

Distance learning resulted in an overall weighted mean of 3.21, interpreted as Moderate. Communication between trainers and trainees received the highest rating at WM = 3.32, followed by technical support at WM = 3.21 and assessment at WM = 3.20. Audio-visual learning resources received the lowest rating at WM = 3.13. The findings indicate that communication, technical assistance, and competency-based assessment remained important concerns in the absence of regular face-to-face interaction. The findings indicate that effective distance learning requires learner autonomy, sustained communication, instructional resources, and institutional support. Ndibalema (2022) emphasized self-directed learning, academic supervision, communication, and technological assistance, while Meng et al. (2024) highlighted instructor interaction, instructional design, infrastructure, and learner support. Ndibalema (2022) similarly identified connectivity, technology access, and communication barriers among Filipino learners. These results are consistent with the Technology Acceptance Model (TAM) proposed by Cavus et al. (2022) and Technological Pedagogical Content Knowledge (TPACK) Framework suggested by Schmid et al. (2024).

3.3.4 Combined Distance and Face-to-Face Learning

Trainees reported Moderate challenges in combined distance and face-to-face learning, with an overall weighted mean of 3.20. Technical support had the highest rating at WM = 3.39, followed by communication at WM = 3.33 and audio-visual resources at WM = 3.22. Printed learning materials had the lowest rating at WM = 2.99. The findings indicate that timely technical assistance, communication, and multimedia learning resources were more problematic than printed materials. The results show that successful hybrid delivery depends on learner preparation, instructional design, technological accessibility, and institutional support. Ashraf et al. (2022) emphasized deliberate integration of classroom and digital learning, while Ashraf et al. (2022) identified self-regulation, technological adaptation, flexibility, and communication as challenges in blended environments. Meng et al. (2024) emphasized learner engagement, instructional quality, infrastructure, institutional support, and interaction, while Ndibalema (2022) reported technical and socio-economic constraints among Filipino students. The results are also consistent with the Technology Acceptance Model (TAM) proposed by Cavus et al. (2022) and the Technological Pedagogical Content Knowledge (TPACK) Framework presented by Schmid et al. (2024).

3.3.5 Socio-Economic Challenges

Trainees reported Moderate socio-economic challenges, with an overall weighted mean of 3.03. Freedom from household chores received the highest rating at WM = 3.26, followed by freedom from interruptions by friends at WM = 3.22 and the ability to purchase prepaid internet load at WM = 3.18. The ability to purchase ICT equipment received the lowest rating at WM = 2.76. These results indicate that household responsibilities, internet expenses, access to ICT resources, and financial capacity influenced participation in flexible learning. The results reinforce the importance of socio-economic conditions in digital access and educational continuity. Ndibalema (2022) identified financial constraints, internet access, and technological resources as barriers, while Meng et al. (2024) emphasized equitable technology access and institutional preparation. Ndibalema (2022) similarly reported financial constraints, unreliable connectivity, and insufficient device access among Filipino students. UNESCO (2023) further emphasized continuing socio-economic disparities in digital education. These findings are consistent with the Technology Acceptance Model (TAM) published by Cavus et al. (2022), which recognizes the importance of enabling conditions for technology adoption.

3.3.6 Psychological Challenges

Trainees experienced Moderate psychological challenges, with an overall weighted mean of 2.99. Ease of reaching fellow trainees had the highest rating at WM = 3.23, followed by reaching trainers at WM = 3.09 and internet connectivity at WM = 3.03. Navigating web applications and having technical support received the lowest ratings at WM = 2.85. The findings indicate that communication, technological confidence, internet access, and technical support influenced trainees' psychological preparedness for flexible learning. The results indicate that confidence, motivation, technological readiness, interaction, and institutional support shape learner adjustment. Xu and Wang (2023) associated confidence, motivation and adaptability with academic engagement, while Xu and Wang (2023)

identified changes in instructional delivery, reduced social interaction, and technological demands as influences on student experience. Meng et al. (2024) emphasized engagement, interaction, institutional support, and technological preparedness, while Ndibalema (2022) identified connectivity, device access, and learner support among Filipino students. The findings are also consistent with the Technology Acceptance Model (TAM) proposed by Cavus et al. (2022) and the Technological Pedagogical Content Knowledge (TPACK) Framework of Schmid et al. (2024).

3.3.7 Overall Challenges of Trainees

Across all dimensions, trainees experienced a Moderate overall challenge level of WM = 3.15. Blended learning produced the highest weighted mean at 3.32, followed by distance learning at 3.21, online learning and combined distance and face-to-face learning at 3.20 each, socio-economic challenges at 3.03, and psychological challenges at 2.99. Thus, trainees generally adapted to flexible learning but continued to encounter interconnected instructional, technological, socio-economic, and learner-related difficulties. The results indicate that flexible learning depends on learner engagement, instructional quality, technological readiness, equitable resource access, and institutional support. Meng et al. (2024) emphasized these interconnected dimensions, while UNESCO (2023) highlighted inclusive access to technology and supportive learning environments. The Organization for Economic Co-operation and Development (OECD, 2023) emphasized learner-centered policy, infrastructure, and capacity development, and Ndibalema (2022) identified connectivity, digital devices, and socio-economic circumstances as determinants of participation. The findings are also consistent with the Technology Acceptance Model (TAM) proposed by Cavus et al. (2022) and the Technological Pedagogical Content Knowledge (TPACK) Framework developed by Schmid et al. (2024).

3.4 Differences in Flexible-Learning Challenges According to Respondent Characteristics

3.4.1 Trainer Challenges According to Age

No statistically significant differences were found in trainers' challenges according to age. The p-values were .587 for Online Learning Delivery Mode, .726 for Blended Learning Delivery Mode, .656 for Distance Learning Delivery Mode, .663 for Combination of Distance Learning and Face-to-Face Learning, and .386 for Organizational Challenges. All exceeded the 0.05 level of significance; therefore, the null hypothesis was accepted. Trainers across age groups experienced comparable instructional, technological, and organizational challenges. The findings indicate that common institutional conditions may have had greater influence than age. Wohlfart and Wagner (2023) reported similar instructional challenges among educators working under shared institutional conditions, while Cavus et al. (2022) identified organizational support, digital competence, and institutional preparation as more influential than demographic characteristics. The Organization for Economic Co-operation and Development (OECD, 2023) likewise emphasized leadership and organizational readiness, while Cavus et al. (2022) found institutional conditions and digital competence to be stronger predictors of technology adoption. The findings are also consistent with the Technology Acceptance Model (TAM) created by Cavus et al. (2022) and the Technological Pedagogical Content Knowledge (TPACK) Framework of Schmid et al. (2024). OECD (2023) further supports institution-wide professional development rather than age-specific interventions.

3.4.2 Trainee Challenges According to Socio-Economic Status

Socio-economic status produced statistically significant differences in Online Learning Delivery Mode ($t = -2.623$, $p = .038$) and Socio-economic Challenges ($t = -2.368$, $p = .045$); therefore, the null hypothesis was rejected for these dimensions. No significant differences were found for Blended Learning Delivery Mode ($p = .358$), Distance Learning Delivery Mode ($p = .886$), Combination of Distance Learning and Face-to-Face Learning ($p = .968$), or Psychological Challenges ($p = .677$). The significant differences indicate that economic circumstances influenced trainees' online-learning experiences and socio-economic barriers. Ndibalema (2022) associated socio-economic circumstances with differences in internet access, devices, and learning resources, while Ndibalema (2022) reported financial and technological inequalities among Filipino students. UNESCO (2023) recognized the influence of socio-economic inequalities on resource access, while the Organization for Economic Co-operation and Development (OECD, 2023) emphasized institutional measures that promote equitable participation. These findings are reinforced by Ndibalema (2022), Meng et al. (2024), and Ndibalema (2022). They are also consistent with the Technology Acceptance Model (TAM) proposed by Cavus et al. (2022) and the Technological Pedagogical Content Knowledge (TPACK) Framework developed by Schmid et al. (2024). UNESCO (2023) and OECD (2023) further emphasize inclusive institutional responses to socio-economic inequalities.

3.4.3 Trainee Challenges According to Distance from School

No statistically significant differences were found between trainees living within 10 kilometers of the institution and those living more than 10 kilometers away. The p-values were .830 for Online Learning Delivery Mode, .731 for Blended Learning Delivery Mode, .693 for Distance Learning Delivery Mode, .961 for Combination of Distance Learning and Face-to-Face Learning, .625 for Socio-economic Challenges, and .429 for Psychological Challenges. All exceeded 0.05; therefore, the null hypothesis was accepted. The findings suggest that geographical

distance was less influential than instructional quality, technology access, and institutional support. Meng et al. (2024) identified instructional quality, technological readiness, and institutional support as major influences on flexible-learning engagement, while UNESCO (2023) emphasized the capacity of flexible learning to reduce geographical barriers. UNESCO-UNEVOC (2022) similarly recognized technology-assisted TVET as a means of expanding access for geographically dispersed learners, and Organization for Economic Co-operation and Development (OECD, 2023) emphasized equitable digital access. Meng et al. (2024) and Ndibalema (2022) further indicate that institutional and technological conditions can be more influential than residence location. The findings are also consistent with the Technology Acceptance Model (TAM) by Cavus et al. (2022) and the Technological Pedagogical Content Knowledge (TPACK) Framework proposed by Schmid et al. (2024). UNESCO (2023) and OECD (2023) support maintaining inclusive digital-learning systems regardless of learners' geographical location.

3.4.4 Trainee Challenges According to ICT Device

No statistically significant differences were found according to whether trainees primarily used laptops/desktops or Android smartphones. The p-values were .144 for Online Learning Delivery Mode, .325 for Blended Learning Delivery Mode, .547 for Distance Learning Delivery Mode, .695 for Combination of Distance Learning and Face-to-Face Learning, .523 for Socio-economic Challenges, and .734 for Psychological Challenges. All exceeded the 0.05 significance level; therefore, the null hypothesis was accepted. The findings indicate that the specific device used was less influential than accessibility, instructional quality, and learner support. Meng et al. (2024) associated flexible-learning success more strongly with instructional quality, engagement, institutional support, and learning resources, while Meng et al. (2024) emphasized instructional design, learner support, and meaningful engagement. UNESCO (2023) emphasized interoperability across technological platforms, and the Organization for Economic Co-operation and Development (OECD, 2023) highlighted accessible educational systems. Based on Meng et al. (2024), device differences have less influence when instructional and institutional conditions are adequate, while Meng et al. (2024) similarly emphasized accessible platforms and well-designed materials. The results are also consistent with the Technology Acceptance Model (TAM) by Cavus et al. (2022) and the Technological Pedagogical Content Knowledge (TPACK) Framework proposed by Schmid et al. (2024). UNESCO (2023) and OECD (2023) further support device-accessible digital learning.

3.5 Implications for the Enhanced Learning Management System

The combined findings show that trainers faced High overall challenges, particularly in combined distance and face-to-face learning and organizational implementation, whereas trainees experienced Moderate challenges across instructional, technological, socio-economic, and psychological dimensions. Socio-economic status significantly differentiated trainees' online-learning and socio-economic challenges, while trainer age, trainee distance from school, and primary ICT device did not produce significant differences. These results provide the empirical basis for an Enhanced Learning Management System responsive to the instructional, technological, organizational, socio-economic, and learner-related issues identified in the study. The proposed ELMS should consequently function as an integrated instructional and institutional support environment rather than merely a repository of learning materials. The findings support features addressing digital and downloadable learning resources, mobile-responsive and low-bandwidth access, competency-based assessment, communication and collaboration, learner progress monitoring, technical assistance, faculty development, curriculum management, administrative monitoring, quality assurance, and learning analytics. These directions are consistent with the Technology Acceptance Model (Cavus et al., 2022) and the TPACK Framework (Schmid et al., 2024), which emphasize usable and accessible educational technologies integrated with appropriate pedagogical and institutional support.

4. Conclusion & Recommendations

The study concludes that trainers and trainees of Zamboanga Sibugay Polytechnic Institute demonstrated basic preparedness for flexible learning, although challenges remained in its implementation. Trainers possessed the necessary educational qualifications, Trainers Methodology certifications, ICT resources, and internet connectivity but experienced instructional, technological, and particularly organizational challenges related to institutional support, curriculum implementation, faculty development, ICT infrastructure, technical assistance, and quality assurance. Trainees generally adapted to flexible learning but encountered instructional, technological, socio-economic, and psychological challenges involving access to learning resources, internet connectivity, financial capacity, motivation, and well-being. Trainer age did not significantly differentiate the challenges experienced, while trainees' socio-economic status significantly affected their online-learning and socio-economic challenges; distance from school and type of ICT device used did not produce significant differences. Overall, the findings demonstrate the importance of sustained institutional and learner support in strengthening flexible learning implementation.

Zamboanga Sibugay Polytechnic Institute should strengthen flexible learning through continuous improvement of ICT infrastructure, internet connectivity, technical support, learner services, and the Learning Management System, together with regular monitoring and evaluation for compliance with TESDA standards. TESDA should continue providing policy guidance, technical assistance, and professional development, while trainers should strengthen their competencies in digital pedagogy, LMS use, online assessment, competency-based training, communication, and learner-centered instruction. Trainees should further develop digital literacy, independent learning, time management, and effective use of available academic and learner-support services. The institution's IT personnel should maintain a device-compatible, low-bandwidth-accessible LMS with downloadable resources, communication, learner-progress monitoring, and technical-support functions, while curriculum planners should periodically review competency-based curricula, resources, and flexible delivery modes in relation to TESDA requirements, technological developments, and industry needs. Future researchers may replicate the study in other TVET institutions and examine additional factors or employ mixed-methods or qualitative designs.

The study was limited to selected trainers and trainees in the diploma programs of Zamboanga Sibugay Polytechnic Institute during Academic Year 2020–2021 and therefore did not include respondents from other programs or institutions. It focused on the identified instructional, technological, organizational, socio-economic, and psychological challenges and selected respondent characteristics. The proposed Enhanced Learning Management System was developed from the study findings as a basis for improving flexible learning; its actual implementation and evaluation were beyond the scope of the study.

5. Compliance with ethical standards

The authors conducted the study in accordance with the ethical principles of respect for persons, beneficence, justice, confidentiality, and voluntary participation. Appropriate institutional authorization was obtained before data collection, and the participants were informed of the study's purpose, their rights, and the voluntary nature of their participation. Informed consent was secured prior to participation, and participants were allowed to decline or withdraw without penalty or adverse consequences. The authors maintained anonymity and confidentiality by excluding personal identifiers from the questionnaire, restricting access to the collected data to the researcher and study adviser, and ensuring that the information was used solely for academic and research purposes. The collection, processing, storage, and retention of personal information followed Republic Act No. 10173 or the Data Privacy Act of 2012. The authors reported the findings objectively and appropriately acknowledged all sources to maintain research integrity and avoid plagiarism.

REFERENCES

Ashraf, M. A., Mollah, S., Perveen, S., Shabnam, N., & Nahar, L. (2022). Pedagogical applications, prospects, and challenges of blended learning in Chinese higher education: A systematic review. Frontiers in Psychology, 12, 772322. https://doi.org/10.3389/fpsyg.2021.772322

Cavus, N., Omonayajo, B., & Mutizwa, M. R. (2022). Technology Acceptance Model and Learning Management Systems: Systematic literature review. International Journal of Interactive Mobile Technologies, 16(23), 109–124. https://doi.org/10.3991/ijim.v16i23.36223

Creswell, J. W., & Creswell, J. D. (2023). Research design: Qualitative, quantitative, and mixed methods approaches (6th ed.). SAGE Publications.

International Labour Organization. (2022). Skills development and lifelong learning: Resource guide for workers' organizations. International Labour Organization.

Meng, W., Yu, L., Liu, C., Pan, N., Pang, X., & Zhu, Y. (2024). A systematic review of the effectiveness of online learning in higher education during the COVID-19 pandemic period. Frontiers in Education, 8, 1334153. https://doi.org/10.3389/feduc.2023.1334153

National Privacy Commission. (2024). NPC Circular No. 2024-01: Amendments to certain provisions of the 2021 Rules of Procedure of the National Privacy Commission. https://privacy.gov.ph/wp-content/uploads/2024/05/2023-compendium-2.pdf

Ndibalema, P. (2022). Constraints of transition to online distance learning in Higher Education Institutions during COVID-19 in developing countries: A systematic review. E-Learning and Digital Media, 19(6), 595–618. https://doi.org/10.1177/20427530221107510

OECD. (2023). OECD Digital Education Outlook 2023: Towards an effective digital education ecosystem. OECD Publishing. https://doi.org/10.1787/c74f03de-en

Schmid, M., Brianza, E., Mok, S. Y., & Petko, D. (2024). Running in circles: A systematic review of reviews on technological pedagogical content knowledge (TPACK). Computers & Education, 214, 105024. https://doi.org/10.1016/j.compedu.2024.105024

Technical Education and Skills Development Authority. (2022). TESDA Circular No. 021, s. 2022: Policy guidelines on the utilization of the multi-regional TESDA Online Program in flexible learning delivery in TVET. TESDA.

Technical Education and Skills Development Authority. (2024). The Philippine TVET trainer qualifications framework 2024. TESDA

UNESCO-UNEVOC. (2022). Trends mapping study: Digital skills development in TVET teacher training. UNESCO-UNEVOC International Centre.

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

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

Wohlfart, O., & Wagner, I. (2023). Teachers' role in digitalizing education: An umbrella review. Educational Technology Research and Development, 71, 339–365. https://doi.org/10.1007/s11423-022-10166-0

Xu, T., & Wang, H. (2023). High prevalence of anxiety, depression, and stress among remote learning students during the COVID-19 pandemic: Evidence from a meta-analysis. Frontiers in Psychology, 13, 1103925. i