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Teachers' Information and Communication Technology Competence: Basis for the Development of Technology Guide for Teaching and Learning

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A B S T R A C T

This study investigates teachers' information and communication technology (ICT) competence levels across six dimensions: information and data literacy, communication, and collaboration, digital content creation, safety and security, problem-solving, and analyzing and reflecting. A descriptive-developmental design was used and data were treated using percentages, weighted mean, and cumulative percent techniques. The study includes sixty four (64) primary and higher education teachers in the Province of Masbate. Findings reveal that teachers are competent overall, with strengths in basic browsing, searching, and data filtering but weaknesses in evaluating and managing information and engaging in collaborative online practices. While teachers demonstrate competency in producing digital content and understanding copyright, they need help with advanced formatting and processing complex content. Safety and security showed significant attention, yet deficiencies persist in designing adequate learning resources and problem-solving with ICT tools. A Technology Guide for Teaching and Learning (TGTL) is developed to address these gaps, comprising six modules aligned with ICT competency indicators. Teachers highly accept the TGTL, acknowledging its potential to enhance competence across dimensions. Recommendations for implementation include re-echoing and school-based training, continuous professional development, and revisiting maintenance and operating expenses for specialized workshops. Conclusions underscore the importance of integrated approaches to ICT competency development, particularly in areas of weakness such as problem-solving and collaboration. The TGTL demonstrates the potential to improve teacher competence and can be replicated for broader implementation in primary and higher education settings. This study contributes to the ongoing effort to equip educators with the skills necessary for effective digital teaching and learning.

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R E S U M O

Este estudo investiga os níveis de competência em tecnologia da informação e comunicação (TIC) dos professores em seis dimensões: alfabetização em informação e dados, comunicação e colaboração, criação de conteúdo digital, segurança e proteção, resolução de problemas e análise e reflexão. Um design descritivo-desenvolvimentista foi usado e os dados foram tratados usando porcentagens, média ponderada e técnicas de porcentagem cumulativa. O estudo inclui sessenta e quatro (64) professores de ensino fundamental e superior na província de Masbate. As descobertas revelam que os professores são competentes em geral, com pontos fortes em navegação básica, pesquisa e filtragem de dados, mas fraquezas na avaliação e gerenciamento de informações e envolvimento em práticas colaborativas online. Embora os professores demonstrem competência na produção de conteúdo digital e compreensão de direitos autorais, eles precisam de ajuda com formatação avançada e processamento de conteúdo complexo. A segurança e a proteção mostraram atenção significativa, mas as deficiências persistem no design de recursos de aprendizagem adequados e na resolução de problemas com ferramentas de TIC. Um Guia de Tecnologia para Ensino e Aprendizagem (TGTL) é desenvolvido para abordar essas lacunas, compreendendo seis módulos alinhados com indicadores de competência em TIC. Os professores aceitam muito o TGTL, reconhecendo seu potencial para aprimorar a competência em todas as dimensões. As recomendações para implementação incluem treinamento baseado em escola e re-eco, desenvolvimento profissional contínuo e revisitação de despesas de manutenção e operação para workshops especializados. As conclusões ressaltam a importância de abordagens integradas para o desenvolvimento de competências em TIC, particularmente em áreas de fraqueza, como resolução de problemas e colaboração. O TGTL demonstra o potencial para melhorar a competência do professor e pode ser replicado para implementação mais ampla em ambientes de ensino primário e superior. Este estudo contribui para o esforço contínuo de equipar educadores com as habilidades necessárias para ensino e aprendizagem digitais eficazes.

Palavras-Chave
Competência em TIC, desenvolvimento de guias tecnológicos, ensino e aprendizagem

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Introduction

Advancements in information and communication technology (ICT) have significantly impacted daily life, transforming work, education, and leisure. As students grow in a rapidly evolving technological landscape, teachers must equip them with the knowledge and skills to participate in a global society. ICTs empower educators and learners, fostering change, promoting 21st-century skills, and improving education systems. However, effective ICT integration remains a challenge, requiring enhanced teacher competencies and empirical evidence to support its benefits.

ICT competency is essential for today's educators, enabling them to personalize learning, introduce innovations, and engage students effectively. ICT integration enhances the pedagogical process, professional development, and the overall quality of education (Murithi & Yoo, 2021; Yuldasheva, 2021). In the Philippines, educators are encouraged to adopt ICT to modernize teaching practices and develop students' 21st-century skills, addressing the demands of distance learning during the pandemic (Caraig et al., 2020; De La Rama et al., 2020). However, Filipino teachers often possess only basic ICT knowledge, necessitating further development (Caluza, 2017).

In Masbate, ICT integration in education is crucial to addressing poverty and improving teaching quality. Teachers' ICT competence significantly impacts the educational system's ability to equip students with essential skills. However, the Province lags behind its Bicol Region neighbors in higher education outcomes, highlighting the need for focused teacher training and development programs (Philippine Statistics Authority, 2017).

This study addresses gaps in research on ICT competence by assessing Masbate teachers' skills and developing a technology guide tailored to their needs. By employing a descriptive-developmental approach, the study aims to support teachers' growth and enhance ICT integration in classrooms, fostering a more relevant and effective teaching-learning process for Masbateño learners.

The study determined the Information and Communication Technology competence of teachers for both secondary and higher education institutions in the Province of Masbate. This enabled the study to use the developed technology guide for teaching and learning and specifically guided by the following objectives: 1. Determine the level of information and communication technology competence of teachers along six dimensions, namely: Information and data literacy; Communication and collaboration; Digital content creation; Safety and security; Problem-solving; Analyzing and reflecting. 2. Develop the technology guide for teaching and learning based on cumulative per cent results along six dimensions of information and communication technology. 3. Analyze the level of acceptability of the developed technology guide in terms of: Structure and Format; Contents; Assessment; 4.

Identify the recommendations provided by the teachers to implement the developed technology guide for teaching and learning.

Methodology

This study utilized a descriptive-developmental research design to characterize the Information and Communication Technology (ICT) competence of teachers and to develop a technology guide for teaching and learning. A descriptive approach, as defined by Singh (2013), was used to identify the status of ICT competence across six dimensions: information and data literacy, communication and collaboration, digital content creation, safety and security, problem-solving, and analyzing and reflecting. The study employed survey questionnaires to gather baseline data and to assess the teachers' competence and the acceptability of the developed guide, using tools adapted from Al-Khateeb (2017) and Rubach & Lazarides (2021). Responses were measured on a five-point Likert scale.

The ADDIE instructional model (Analysis, Design, Development, Implementation, and Evaluation) guided the development process. During the analysis phase, the problem and potential solutions were identified. The design phase established measurable processes and activities. The development phase involved creating educational materials such as modules. The implementation phase focused on delivering teacher training to address identified needs. Lastly, the evaluation phase provided recommendations to refine the instructional materials.

The study involved 75 teachers from the City Schools Division of Masbate, the Schools Division of Masbate Province, and selected higher education institutions. Stratified random sampling, with Cochran's equation for sample size determination, ensured the representation of various subgroups. Data collection was conducted through face-to-face and online survey questionnaires. Prior to administration, the instruments underwent face-content validation by experts and revisions based on feedback.

Data were analyzed using weighted means to assess competence levels and acceptability, and cumulative percent values to identify areas requiring intervention. This analysis informed the development of the technology guide and delineated the respondents' ICT competence levels. The process adhered to ethical research standards, including compliance with the Data Privacy Act of 2012 and obtaining informed consent from all participants.

Results

Level of Information and Communication Technology Competence of Teachers

Teachers' ICT competencies were assessed across six dimensions: information and data literacy, communication and collaboration, digital content creation, safety and security, problem-solving, and analyzing and reflecting. These competencies influence how effectively

teachers innovate educational resources and methods, shaping the teaching and learning process. A teacher's proficiency in using ICT tools directly impacts student mastery, emphasizing the need for educators to adapt to evolving technologies and meet 21st-century skill demands.

In Masbate, teachers exhibited positive ICT competence in information and data literacy, with 35.4% reflecting proficiency. Respondents demonstrated high competence in using search engines to find information (19.5%), saving and storing files (24.4%), and utilizing cloud storage (29.3%). However, moderate competence was noted in advanced search strategies (41.5%) and assessing information reliability and validity (53.7%). These findings underscore the importance of continuous professional development to enhance teachers' ICT capabilities and align with the demands of modern education.

Table 1.

Information and Communication Technology Competence of Faculty Members of Basic and Higher Education Institutions in the Province of Masbate Along Information and Data Literacy

Competency Indicators	Parameters	NC	FC	MC	Co	HC	CP	Verbal Interpretation
I can use different search engines to find information.	Frequency	0	1	7	16	17	19.5	Highly Competent
	Per cent	0	2.4	17.1	39.0	41.5		
I can look for information online using a search engine.	Frequency	0	0	8	12	21	19.5	Highly Competent
	Per cent	0	0	19.5	29.3	51.2		
I can save or store files or content and retrieve them once saved or stored.	Frequency	0	1	9	16	15	24.4	Competent
	Per cent	0	2.4	22.0	39.0	36.6		
I can save information found on the internet in different formats and use cloud information storage services.	Frequency	1	2	9	19	10	29.3	Competent
	Per cent	2.4	4.9	22.0	46.3	24.4		
I can use advanced search strategies to find reliable information on the internet such as using web feeds.	Frequency	1	3	13	18	6	41.5	Moderately Competent
	Per cent	2.4	7.3	31.7	43.9	14.6		
I classify the information in a methodical way using folders and backups of information or files I have stored.	Frequency	0	2	17	10	12	46.3	Moderately Competent
	Per cent	0	4.9	41.5	24.4	29.3		
I use some filters when searching to compare and assess the reliability of the information I find.	Frequency	1	3	17	17	3	51.2	Moderately Competent
	Per cent	2.4	7.3	41.5	41.5	7.3		
I can assess the validity and credibility of information using a range of criteria.	Frequency	2	3	17	15	4	53.7	Moderately Competent
	Per cent	4.9	7.3	41.5	36.6	9.8		
Over All Level of Competence							35.4	Competent

Legend: NC – Not Competent FC – Fairly Competent MC – Moderately Competent
Co – Competent HC – Highly Competent CP – Cumulative Per Cent

The findings highlight that while teachers excel in basic browsing and using search engines, they struggle with advanced strategies for locating credible information and ensuring data reliability. Limited proficiency in search criteria and evaluating sources impacts their ability to design effective assessments using online tools. Studies by Omar et al. (2012) and Ruyi et al. (2022) underscore the role of data literacy in enhancing digital competence. Additionally, challenges posed by misinformation require improved fact-checking skills, as emphasized by Cahapay (2022). Strengthening communication and collaboration skills is

essential for fostering meaningful digital interactions and promoting collaborative learning among teachers.

Table 2.
Information and Communication Technology Competence of Faculty Members of Basic and Higher Education Institutions in the Province of Masbate Along Communication and Collaboration

Competency Indicators	Parameters	NC	FC	MC	Co	HC	CP	Verbal Interpretation
I can communicate with others using Skype or chat – using basic features (e.g. emails, voice messaging, SMS, text exchange).	Frequency	0	0	7	14	20	17.1	Highly Competent
	Per cent	0	0.0	17.1	34.1	48.8		
I can use advanced features of several communication tools (e.g. using Skype, Zoom, Google Meet and sharing files).	Frequency	0	1	6	19	15	17.1	Highly Competent
	Per cent	0	2.4	14.6	46.3	36.6		
I can actively use a wide range of communication tools (e-mail, chat, SMS, instant messaging, blogs, micro-blogs, social networks) for online communication	Frequency	0	1	6	18	16	17.1	Highly Competent
	Per cent	0	2.4	14.6	43.9	39.0		
I can use collaboration tools and contribute to e.g. shared documents/files someone else has created.	Frequency	0	2	10	15	14	29.3	Competent
	Per cent	0	4.9	24.4	36.6	34.1		
I can create and manage content with collaboration tools (e.g. project management systems, online spreadsheets).	Frequency	0	3	12	14	12	36.6	Competent
	Per cent	0	7.3	29.3	34.1	29.3		
I can use advanced features of communication tools (e.g. video conferencing, data sharing, application sharing)	Frequency	2	0	14	14	11	39.0	Competent
	Per cent	4.9	0	34.1	34.1	26.8		
I know I can use online services (e.g., e-banking, e-governments, e-hospitals...etc.).	Frequency	3	2	13	13	10	43.9	Moderately Competent
	Per cent	7.3	4.9	31.7	31.7	24.4		
Over All Level of Competence							29.3	Competent

Legend: NC – Not Competent FC – Fairly Competent MC – Moderately Competent
Co – Competent HC – Highly Competent CP – Cumulative Per Cent

Teachers in Masbate demonstrated moderate competency in ICT communication and collaboration (see Table 2), excelling in basic and advanced features of tools like Zoom, Google Meet, and Gmail. They are skilled in collaborative practices, such as creating and managing shared documents, but struggle with e-banking and e-government services, relying on external assistance for tasks like using GSIS or PhilHealth portals. Enriching these skills is crucial for seamless professional and government interactions.

Teachers integrate ICT tools into teaching through collaborative strategies, fostering student-centered learning. However, their lower engagement in extended learning

opportunities, such as using social media for collaboration, highlights the need for further training. Rubach and Lazarides (2019) and Hero et al. (2021) emphasized that higher ICT competence in communication and collaboration correlates with effective student-centered teaching. In digital content creation, teachers are competent in producing simple formats and editing digital content but require improvement in advanced creation techniques. Enhanced ICT skills will strengthen instructional delivery, blended learning, and project-based activities, benefiting students and promoting effective communication among educators and learners.

Table 3.

Information and Communication Technology Competence of Faculty Members of Basic and Higher Education Institutions in the Province of Masbate Along Digital Content Creation

Competency Indicators	Parameters	NC	FC	MC	Co	HC	CP	Verbal Interpretation
I can produce simple digital content (e.g. text, tables, images, audio files) in at least one format using digital tools.	Frequency	0	1	10	17	13	26.8	Competent
	Per cent	0	2.4	24.4	41.5	31.7		
I know that content can be covered by copyright	Frequency	2	3	7	16	13	29.3	Competent
	Per cent	4.9	7.3	17.1	39.0	31.7		
I can apply basic formatting (e.g. insert footnotes, charts, tables) to the content I or others have produced.	Frequency	0	2	12	13	14	34.1	Competent
	Per cent	0	4.9	29.3	31.7	34.1		
I can make basic editing to content produced by others (e.g., adding and deleting).	Frequency	0	2	13	12	14	36.6	Competent
	Per cent	0	4.9	31.7	29.3	34.1		
I know how to reference and reuse content covered by copyright.	Frequency	3	2	13	18	5	43.9	Moderately Competent
	Per cent	7.3	4.9	31.7	43.9	12.2		
I can produce complex digital content in different formats (e.g. text, tables, images, audio files). I can use tools for creating webpages or blogs.	Frequency	1	5	15	10	10	51.2	Moderately Competent
	Per cent	2.4	12.2	36.6	24.4	24.4		
I can use advanced formatting functions of different tools (e.g. mail merge, merging documents of different formats, using advanced formulas, macros).	Frequency	0	5	21	7	8	63.4	Fairly Competent
	Per cent	0	12.2	51.2	17.1	19.5		
Over All Level of Competence							36.6	Competent

Legend: NC – Not Competent FC – Fairly Competent MC – Moderately Competent
Co – Competent HC – Highly Competent CP – Cumulative Per Cent

Teachers are moderately competent in referencing and reusing copyrighted content and producing complex digital formats, with cumulative percentages of 43.9 and 51.2, respectively. Advanced formatting skills, such as using Canva or performing mail merge for

certificates, require further development. Teachers proficient in managing and creating digital content enhance instructional practices, fostering students' conceptual understanding and engagement through diverse, multi-sensory materials like videos and visualizations. Ertmer et al. (2012) emphasized that integrating digital content supports meaningful learning. Ensuring teachers are highly competent in producing, editing, and recognizing copyrighted content is vital for effective teaching and learning processes.

The Teachers' ICT competency in safety and security highlights their ability to protect devices, data, and well-being while using digital tools for teaching. Results show they are generally competent, particularly in using antivirus software, configuring firewalls, and understanding technology's environmental and health impacts. However, teachers show moderate competence in protecting online credentials and avoiding privacy risks, with a cumulative percentage of 48.8. DICT experts emphasize the need for government services like the Philippine National Public Key Infrastructure for online safety. Teachers also require improvement in troubleshooting and utilizing two-factor authentication.

Table 4.

Information and Communication Technology Competence of Faculty Members of Basic and Higher Education Institutions in the Province of Masbate Along Safety and Security

Competency Indicators	Parameters	NC	FC	MC	Co	HC	CP	Verbal Interpretation
I can take basic steps to protect my devices (e.g. using anti-viruses and passwords).	Frequency	0	1	5	9	26	14.6	Highly Competent
	Per cent	0	2.4	12.2	22.0	63.4		
I have an informed stance on the impact of digital technologies on everyday life and the environment.	Frequency	0	1	8	19	13	22.0	Competent
	Per cent	0	2.4	19.5	46.3	31.7		
I take basic measures and actions to save energy.	Frequency	0	1	9	18	13	24.4	Competent
	Per cent	0	2.4	22.0	43.9	31.7		
I know how to react if my computer is infected by a virus. I can configure or modify the firewall and security settings of my digital devices.	Frequency	0	1	9	15	16	24.4	Competent
	Per cent	0	2.4	22.0	36.6	39.0		
I understand the positive and negative impact of technology on the environment.	Frequency	0	1	10	18	12	26.8	Competent
	Per cent	0	2.4	24.4	43.9	29.3		

I understand the health risks associated with the use of digital technology (e.g., risk of addiction).	Frequency	0	1	10	16	14	26.8	Competent
	Per cent	0	2.4	24.4	39.0	34.1		
I am aware that my credentials (username/password) can be stolen. I know I should not reveal private information online.	Frequency	1	2	17	12	9	48.8	Moderately Competent
	Per cent	2.4	4.9	41.5	29.3	22.0		
Over All Level of Competence							24.4	Competent

Legend: NC – Not Competent FC – Fairly Competent MC – Moderately Competent
Co – Competent HC – Highly Competent CP – Cumulative Per Cent

Competence in safety and security enables student-centered learning, fostering autonomy, individualized instruction, and cognitive growth. However, without adequate teacher guidance in using digital tools, these benefits are unattainable. The study by Hero et al. (2021) aligns with current findings, ranking safety and security as competent but in need of further enrichment.

Regarding problem-solving, teachers in Masbate demonstrate moderate competence (42.65%). While they excel in updating digital skills and finding support for technical issues, they are less competent in solving frequent problems and staying aware of new technological developments. Regular digital skill updates and creative use of tools remain areas for improvement to enhance teaching efficacy.

Table 5.

Information and Communication Technology Competence of Faculty Members of Basic and Higher Education Institutions in the Province of Masbate Along Problem Solving

Competency Indicators	Parameters	NC	FC	MC	Co	HC	CP	Verbal Interpretation
I am aware that I need to update my digital skills regularly.	Frequency	0	4	8	14	15	29.3	Competent
	Per cent	0	9.8	19.5	34.1	36.6		
I frequently update my digital skills to decrease my limits and increase my digital knowledge.	Frequency	0	6	8	19	8	34.1	Competent
	Per cent	0	14.6	19.5	46.3	19.5		
I find support when a technical problem occurs or when using a new program.	Frequency	1	4	11	15	10	39.0	Competent
	Per cent	2.4	9.8	26.8	36.6	24.4		

I regularly update my digital skills. I am aware of my limits and try to fill my gaps.	Frequency	0	5	11	17	8	39.0	Competent
	Per cent	0	12.2	26.8	41.5	19.5		
I am aware of new technological developments. I understand how new tools work.	Frequency	1	6	12	17	5	46.3	Moderately Competent
	Per cent	2.4	14.6	29.3	41.5	12.2		
I can solve most of the more frequent problems that arise when using digital technologies.	Frequency	2	4	16	16	3	53.7	Moderately Competent
	Per cent	4.9	9.8	39.0	39.0	7.3		
I can frequently choose the right tool, device, application, software or service to solve (non-technical) problems.	Frequency	2	6	15	11	7	56.1	Moderately Competent
	Per cent	4.9	14.6	36.6	26.8	17.1		
I can solve technological problems by exploring the settings and options of programmes or tools.	Frequency	3	5	17	10	6	61.0	Fairly Competent
	Per cent	7.3	12.2	41.5	24.4	14.6		
Over All Level of Competence							42.65	Moderately Competence

Legend: NC – Not Competent FC – Fairly Competent MC – Moderately Competent
Co – Competent HC – Highly Competent CP – Cumulative Per Cent

Teachers are fairly competent (61%) in solving technological problems by exploring settings and options of tools. The study suggests that problem-solving competency is linked to teachers' skills in information literacy, communication, collaboration, and analysis. Competence in these areas enhances their use of ICT tools in teaching. During the pilot training in Masbate, DICT and ICT experts observed teachers' difficulty with tasks like MS Office installation.

This aligns with Krauskopf (2019), highlighting the need for further improvement in problem-solving competence. Teachers must stay updated on ICT tools to effectively integrate technology and address technical issues in teaching.

Table 6.

Information and Communication Technology Competence of Faculty Members of Basic and Higher Education Institutions in the Province of Masbate Along Analyzing and Reflecting

Competency Indicators	Parameters	NC	FC	MC	Co	HC	CP	Verbal Interpretation
I can analyze the effect of media in digital environments.	Frequency	0	3	9	16	13	29.3	Competent
	Per cent	0	7.3	22.0	39.0	31.7		
I can evaluate interest-driven dissemination and the dominance of topics in digital space.	Frequency	1	3	11	18	8	36.6	Competent
	Per cent	2.4	7.3	26.8	43.9	19.5		
I can reflect on the opportunities and risks of media use for my media use.	Frequency	0	3	14	12	12	41.5	Moderately Competent
	Per cent	0	7.3	34.1	29.3	29.3		
I can analyze the benefits of business activities and services in digital environments.	Frequency	1	3	13	13	11	41.5	Moderately Competent
	Per cent	2.4	7.3	31.7	31.7	26.8		
I can analyze business activities and service risks in the digital space.	Frequency	1	4	13	15	8	43.9	Moderately Competent
	Per cent	2.4	9.8	31.7	36.6	19.5		
Over All Level of Competence							41.5	Moderately Competent

Legend: NC – Not Competent FC – Fairly Competent MC – Moderately Competent
Co – Competent HC – Highly Competent CP – Cumulative Per Cent

The "analyzing and reflecting" dimension of ICT competency focuses on teachers' ability to systematically evaluate and reflect on the use of ICT tools for teaching. In the Province of Masbate, teachers were found to be moderately competent, with a cumulative percentage of 41.5. Teachers showed competency in analyzing the effect of media in digital environments (29.3%) and evaluating interest-driven dissemination (36.6%). However, they were only moderately competent in reflecting on media use opportunities and risks, as well as analyzing business activities and service risks in digital spaces (41.5% to 43.9%).

The study observed that teachers' competence in creative content development, such as creating e-books using Canva, was present. However, the teachers did not fully achieve a high level of competency in analyzing the appropriateness of digital tools for holistic student development. The results suggest that social factors affect teachers' desire and persistence in using digital tools, and they need to systematically analyze the tools they use in teaching.

This contrasts with Rubach and Lazarides (2021), who suggested that reflective practice enhances teachers' persistence and selection of ICT tools. In this study, teachers did not demonstrate the higher competency required to effectively evaluate and use ICT tools, limiting their ability to improve students' learning outcomes.

Developed Technology Guide for Teaching and Learning Based on Cumulative Per Cent Results

The Technology Guide for Teaching and Learning (TGTL) was developed based on teachers' perceived ICT competence levels to help them design and strengthen competencies for teaching. It integrates effective teaching approaches like problem-based learning, project-based learning, global citizenship education, digital environments, digital technologies, and integrative learning. These approaches support the six ICT dimensions in teaching.

The development of TGTL uses ICT competence indicators as a basis, with values above 35% indicating areas for improvement. Problem-solving emerged as the top priority, while safety and security was less emphasized. TGTL consists of six modules, with Module A focusing on information and data literacy in problem-based learning. It covers defining literacy, evaluating information, and applying skills in problem-solving. Key questions guide the module: "What is Information and Data Literacy?" and "What is Evidence?" The objective is to equip teachers with the necessary skills to design problem-based learning activities effectively.

Table 8.

Matrix of Information and Communication Technology Competence as Basis for Development of Technology Guide for Teaching and Learning

Information and Communication Technology Competence	Cumulative Per cent
Information and Data Literacy	
I can use advanced search strategies to find reliable information on the internet such as using web feeds.	41.5
I classify the information in a methodical way using folders and backups of information or files I have stored.	46.3
I use some filters when searching to compare and assess the reliability of the information I find.	51.2
I can assess the validity and credibility of information using a range of criteria.	53.7
Communication and Collaboration	
I can create and manage content with collaboration tools (e.g. project management systems, online spreadsheets).	36.6
I can use advanced features of communication tools (e.g. video conferencing, data sharing, application sharing)	39.0
I know I can use online services (e.g., e-banking, e-governments, e-hospitals…etc.).	43.9
Digital Content Creation	
I can make basic editing to content produced by others (e.g., adding and deleting).	36.6
I know how to reference and reuse content covered by copyright.	43.9

I can produce complex digital content in different formats (e.g. text, tables, images, audio files). I can use tools for creating webpages or blogs.	51.2
I can use advanced formatting functions of different tools (e.g. mail merge, merging documents of different formats, using advanced formulas, macros).	63.4
Safety and Security	
I am aware that my credentials (username/password) can be stolen. I know I should not reveal private information online.	48.8
Problem-Solving	
I find support when a technical problem occurs or when using a new program.	39.0
I regularly update my digital skills. I am aware of my limits and try to fill my gaps.	39.0
I am aware of new technological developments. I understand how new tools work.	46.3
I can solve most of the more frequent problems that arise when using digital technologies	53.7
I can frequently choose the right tool, device, application, software or service to solve (non-technical) problems.	56.1
I can solve technological problems by exploring the settings and options of programmes or tools.	61.0
Analyzing and Reflecting	
I can evaluate interest-driven dissemination and the dominance of topics in digital space.	36.6
I can reflect on the opportunities and risks of media use for my media use.	41.5
I can analyze the benefits of business activities and services in digital environments.	41.5
I can analyze business activities and service risks in the digital space.	43.9

Problem-based learning (PBL) challenges the traditional lecture-based method, emphasizing active learning where students collaborate to solve real-world problems. Unlike traditional methods where teachers lead, in PBL, teachers guide and support students as they work through problems, enhancing critical thinking and problem-solving skills. This process fosters self-directed learning and takes into account students' existing knowledge (Leibiger, 2011).

Module B, focusing on Communication and Collaboration for Project-Based Learning, aims to develop students' ability to collaborate using digital tools, preparing them for global citizenship through cross-cultural sensitivity and digital citizenship. It also addresses content creation management using online platforms.

Module C, focused on Digital Content Creation, teaches educators to create high-quality digital materials, emphasizing global citizenship education and the practical use of digital tools for webpage creation and data merging. Module D addresses Safety and Security in the Digital Environment, ensuring teachers are equipped to protect students' digital identities and data.

Module E, Problem-Solving for Digital Technologies, tackles troubleshooting and decision-making, helping teachers resolve technical issues and guide students in utilizing digital tools effectively. Finally, Module F, Analyzing and Reflecting for Integrative Learning,

emphasizes critical thinking and reflection, encouraging teachers to evaluate digital information and integrate learning in a digital environment.

The Technology Guide for Teaching and Learning (TGTL) consists of twelve parts, each designed to assist teachers in incorporating technology into their teaching practices. The guide provides empirical evidence, contextual examples, and self-paced, independent learning resources, covering topics such as information literacy, digital content creation, and online collaboration tools. Through this guide, teachers will be better equipped to use technology effectively in their classrooms, supporting students' development of critical 21st-century skills.

Acceptability Level of Technology Guide for Teaching and Learning

The Technology Guide for Teaching and Learning (TGTL) was assessed for acceptability by teachers who participated in the pilot training. The evaluation focused on the guide's structure, format, content, and assessment. Teachers found the guide well-organized, with clear and appropriate topics, concepts, and theories. The content was effectively structured from simple to complex, and the assessment encouraged higher-order thinking. The TGTL received a high acceptability rating with a grand mean of 4.72, indicating strong approval. Each of the six modules, covering topics like communication, digital content, and problem-solving, also received positive evaluations, with weighted mean values ranging from 4.62 to 4.81.

According to Table 18's summary of the TGTL teachers' acceptance level, the safety and security module had the highest weighted mean value of 4.81, which is considered to be extremely acceptable in terms of its structure and format, contents, and assessment. This indicates that educators understood the value of safety and security of using digital technology. Information and data literacy, on the other hand, scored the lowest with a weighted mean of 4.62; however, it was still interpreted as highly acceptable, indicating that teachers also recognized the soundness of the module that presents quality contents that the readers may benefit largely and also with the other modules that was developed.

Table 9.

Level of Acceptability of Technology Guide for Teaching and Learning

Acceptability Level of the Developed TGTL Modules	Mean Scores	Qualitative Interpretation
Module A. Information and Data Literacy		
Structure and Format	4.58	Highly Acceptable
Contents	4.64	Highly Acceptable
Assessment	4.63	Highly Acceptable
Module B. Communication and Collaboration		
Structure and Format	4.61	Highly Acceptable
Contents	4.62	Highly Acceptable
Assessment	4.65	Highly Acceptable
Module C. Digital Content Creation		

Structure and Format	4.69	Highly Acceptable
Contents	4.68	Highly Acceptable
Assessment	4.68	Highly Acceptable
Module D. Safety and Security		
Structure and Format	4.80	Highly Acceptable
Contents	4.82	Highly Acceptable
Assessment	4.82	Highly Acceptable
Module E. Problem-Solving		
Structure and Format	4.79	Highly Acceptable
Contents	4.77	Highly Acceptable
Assessment	4.80	Highly Acceptable
Module F. Analyzing and Reflecting		
Structure and Format	4.77	Highly Acceptable
Contents	4.79	Highly Acceptable
Assessment	4.79	Highly Acceptable
Grand Mean Scores	4.72	Highly Acceptable

Hero et al. (2021) found that safety and security had the lowest mean, and information and data literacy was second lowest, suggesting varying teacher perceptions of ICT modules. Garzón-Artacho et al. (2021) emphasized the importance of information literacy in enhancing digital content creation. They noted similar digital competence levels among teachers, reflecting variation across the country. The assessment of the technology guide's acceptability, conducted during a four-day pilot training in Masbate, showed that the modules are valuable for replication in training programs and educational materials.

Recommendations of Teachers to Implement the Technology Guide for Teaching and Learning

The developed technology guide plays a significant role in educational leadership and management, aiming to enhance teachers' competencies through structured development programs. Educational leaders should integrate ICT competency assessments into teaching delivery to ensure sustainable growth. The guide, developed with input from educational experts and DICT, helps teachers improve their ICT skills, which are vital for effective teaching in today's digital age.

Feedback from pilot training participants highlights the potential for the guide's wider application. Many teachers suggested extending the training through School Learning Action Cells (SLAC) and In-Service Training (INSET), ensuring broader reach across schools. This aligns with research indicating that teacher collaboration and continuous professional development lead to improved teaching quality and classroom practices.

However, challenges like limited funding for travel and training costs hinder broader participation. Recommendations include revisiting budget allocations and enhancing monitoring mechanisms for teachers' re-entry plans after training. Continuous support from school leaders is essential to sustain the integration of ICT into classrooms. The technology guide, though initially developed for ICT-related subjects, has the potential for cross-curricular application, further supporting the development of students' ICT competencies. To

successfully implement the guide, teachers and school leaders must commit to ongoing professional development, ensuring that students are prepared for the digital age. The copyright of the guide remains with its authors and will be made public once educational programs are established for its dissemination.

Conclusions and Recommendations

The study found that teachers' ICT competence was moderate across six key dimensions. While teachers excelled in browsing and filtering digital information, they needed further development in data evaluation and management. Although capable of producing digital content, they required improvement in using collaboration tools and advanced features. Teachers showed a strong understanding of digital safety but needed deeper knowledge and application in this area. The technology guide modules were effective in enhancing ICT competencies and were well-received. Teachers recommended ongoing training and revisiting budgets for specialized workshops.

Recommendations include regular ICT competence evaluations to guide targeted training, encouraging digital tool integration in classrooms, and incorporating the developed modules into teacher development programs. Future research should examine the cost-effectiveness of ICT training, teachers' attitudes toward digital content creation, and barriers to implementing the technology guide. Increasing study participants could provide more insights into teachers' ICT competence.

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