
Instructional e-Package on Digital Tools: Building Digital Competence for Pre-service Teachers

Shiela Mae I. Segumpan*; Wilfred G. Alava Jr.**

**Faculty, College of Education, Central Mindanao University, Maramag, Bukidnon, Philippines*

***Faculty, College of Education, Bukidnon State University, Malaybalay City, Bukidnon, Philippines*

ABSTRACT

Digital competence (DC) is key to lifelong learning, especially with the technological landscape and with the COVID-19 pandemic confronted in the education sector. The study designed, developed, implemented, and evaluated the instructional e-package on digital tools (IePoDT) to build the DC of English Pre-service Teachers (PSTs) of Central Mindanao University in teaching Media and Information Literacy (MIL). It sought to analyze the needs of PSTs in terms of DC in teaching MIL; design the IePoDT to enhance the digital competence of the PSTs; develop the IePoDT for PSTs; implement the IePoDT for PSTs and evaluate the effectiveness of the IePoDT for PSTs. It is a developmental research design where ADDIE Model was adopted. Also, the Digital Competence Framework of EU Science Hub (DigComp) was adapted and used for this study. Findings reveal that, in general, the PSTs' DC needs assessment was found moderately competent. The digital tools classified as information and data literacy, communication and collaboration, and digital content creation to address the PSTs' digital competence were included in the IePoDT, where PSTs were less knowledgeable to exceptionally knowledgeable. Safety and security competencies were embedded in each digital tool. The experts positively evaluated the IePoDT and the training implementation as extremely satisfied. Moreover, PSTs significantly improved their training performance from Did Not Meet Expectations to Satisfactory, with a p-value of .000, before and after the implementation of the IePoDT, respectively. The PSTs' DC was manifested as the experts were extremely satisfied with their training output.

KEYWORDS: *digital competence, digital tools, instructional e-package, pre-service teachers, Media and Information Literacy*

INTRODUCTION

Digital competence is essential for teachers (Cabero- Almenara et al., 2020; Mercader & Gairin, 2021; Basilotta-Gómez-Pablos et al., 2022). It has always been coupled with strategies and has been a way of life in teaching. In this field, there have been revolutionary changes in how teachers have adapted to the technological and digital era, how their digital competencies have been incorporated into the teaching and learning processes, and how their digital awareness and competencies have emerged to include lifelong learning (Garzón-Artacho et al., 2020; Garzón-Artacho et al., 2021; Karakuş & Kılıç, 2022). It is also highlighted by Stockless et al. (2022) that digital training plays a vital role in the initial training of pre-service teachers. The mastery of information and communications technology (ICT) is always deemed necessary and has been prescriptive (Rana, 2020; Armawati et al., 2021; Stockless et al., 2022); measures of teacher training programs were implemented to

ensure its development and advancement. Today's learners, often tagged as the millennials and Generation Z, are challenged with teaching, and learning perspectives, leading them to an engaged learning environment is a paramount concern (Segumpan & Tan, 2018; Stephenson et al., 2020; Segumpan, 2021).

The COVID-19 pandemic had an impact and changed the course of the delivery of quality education to students (Moorhouse, 2020; Asio, 2021; Chen et al., 2022). Although the increasing application of information and communication technologies in education emerged during the pandemic, advancing the digital capability of teachers is highly regarded in teaching and learning. Not to mention, the role of the educator is indispensable to the increased adoption of digital technologies, with it as an effective tool to make learning more adaptive and flexible (Ghavifekr & Rosdy, 2015; Grand-Clement et al., 2017; Muhtadi et al., 2017).

Aspiring educators or the teachers in the making, the PSTs, are catalysts for change, and embracing the need necessitates change (Ramirez, 2019; Barrera et al., 2020; Mavuru et al., 2021; McGarr et al., 2022). Teaching and learning transformed instantaneously into the distance and remote formats, adapting to change for teacher educators and PSTs, to cope with the unprecedented situation in the perspective of the country (Joaquin et al., 2020; Cahapay & Rotas, 2022; Treceñe, 2022) and in the world (Mohamad et al., 2020; Evagorou & Nisiforou, 2020; Casacchia et al., 2021). The quality of how technology is addressed in teacher education is conditional on how PSTs apply technology (Teo & Van, 2012; Admiraal et al., 2016; Batane & Ngwako, 2017; Han et al., 2017; Thai et al., 2022). With the skills needed in teaching and learning, PSTs must explore diverse experiences with the digital divide (Prachagool et al., 2022; Kwaah et al., 2022; Van de Werfhorst et al., 2022).

From the Media and Information Literacy (MIL) perspective, the prevalent and massive development of modern and contemporary has made MIL a social need (Gretter & Yadav, 2018; Al Zou'bi (2022)). The MIL, according to UNESCO, is the set of fundamental competencies that enable people to engage with the media successfully and cultivate the critical thinking and lifelong learning capacities needed to become engaged citizens (Al-Tawisi et al., 2016; Ramaiah & Rao, 2021). Meanwhile, in the Philippine setting, Bautista Jr. (2021) stressed that teaching the MIL subject in Philippine Senior High Schools faced challenges. The subject course is relatively new, and it remains to be seen that the said MIL can be taught effectively in the country. Also, it was stipulated that teachers are not adequately trained or have minimal access to the necessary materials to teach the subject. Still, nevertheless, they are willing to teach the subject because of its significance and relevance to the learners. Furthermore, the empowerment of Filipino citizens is at the core of MIL (Resplandor, 2021; Labangon & Zabala, 2021). The need for MIL as today's technological advancements are truly interactive (Beltran, 2018; Smith, 2018).

With the education systems confronted by the learning gap and the complexities of situations, these aspiring teachers opted to be adept and digitally competent regardless of the learning modalities. Hence, this study aimed to design, develop, implement, and evaluate the instructional e-package on digital tools to develop the digital competence of English pre-service teachers (PSTs) teaching Media and Information Literacy for the SY 2021-2022.

Statement of Purpose

The study designed, developed, implemented, and evaluated an instructional e-package on digital tools to build the digital competence of English Pre-service Teachers (PSTs).

Specifically, it aimed to:

1. analyze the needs of PSTs in terms of digital competence in teaching Media and Information Literacy;
2. design the instructional e-package to enhance the digital competence of the PSTs;
3. develop the instructional e -package for PSTs;
4. implement the instructional e-package for PSTs; and
5. evaluate the effectiveness of the instructional e-package for PSTs.

MATERIALS AND METHODS

Research Design

This study is developmental research that comprises multiple forms of research. Richey (1994) defined developmental research as opposed to simple instructional development. It has been described as the systematic way of designing, developing, implementing, and evaluating instructional programs. It also described the strategic processes and products that must meet the criteria of internal consistency and effectiveness. Moreover, the development of research is also highly regarded in the field of instructional technology.

Research Locale

The study was conducted at Central Mindanao University. It is situated at University Town, Musuan, Bukidnon, Philippines.

Participants of the study

The study participants were the Bachelor of Secondary Education major in English Pre-service Teachers (PSTs) of the College of Education since these PSTs handle the Media and Information Technology for their Student Internship. A total of 85 PSTs: 69 female and 16 male.

Research Instruments

The instruments were content validated by experts in the field of digital competence, assessment, instructional material development, and language. Various areas were evaluated in the following instruments.

Digital Competence Needs Assessment

The digital competence research instrument adapted by Çebi and Reisoğlu (2020) was used to assess the digital competence needs of the English PSTs. The instrument underwent pilot testing with a reliability coefficient or a Cronbach alpha of 0.964. Permission to adapt the research instrument was also sought from the Turkish authors. This research instrument comprises five (5) areas: Information and Data Literacy, Communication and Collaboration, Digital Content Creation, Safety, and Problem-Solving. It was based on the Digital Competence Framework of EU Science Hub (DigComp). The scale below is used to understand the data better.

Range	Descriptive Rating	Qualitative Interpretation
4.51 – 5.00	Strongly Agree	Very Highly Competent
3.51 – 4.50	Agree	Highly Competent
2.51 – 3.50	Moderately Agree	Moderately Competent
1.51 – 2.50	Disagree	Least Competent
1.00 – 1.50	Strongly Disagree	Not Competent at all

Furthermore, a researcher-made instrument on digital tools was made after identifying the items on the digital competencies that pre-service teachers were least competent. The pre-service teachers assessed themselves as to which digital tools they were less familiar with using the instrument. It encompassed digital tools in the context of teaching Media and Information Literacy, which conforms to the adapted digital competence framework, which includes information data literacy, communication and collaboration, and digital content creation. In addition, competence in safety and problem-solving was embedded in each digital tool in the courseware. The said needs assessment underwent content validation and pilot testing with a reliability coefficient of 0.887. Moreover, the scale below was utilized to understand the data better.

Range	Descriptive Rating	Qualitative Interpretation
4.51 – 5.00	Very High	Exceptionally Knowledgeable
3.51 – 4.50	High	Highly Knowledgeable
2.51 – 3.50	Fair	Moderately Knowledgeable
1.51 – 2.50	Poor	Less Knowledgeable
1.00 – 1.50	Very Poor	Not Knowledgeable

Evaluation of the Courseware for the Instructional e-Package on Digital Tools, Implementation of the Instructional e-Package, and the Training Output

The research instruments for the evaluation were adapted by Alava (2017) and further modified by the researcher. It covers various areas in the said evaluation. The scale was utilized to understand the data better.

Range	Descriptive Rating	Qualitative Interpretation
4.51 – 5.00	Strongly Agree	Extremely Satisfied
3.51 – 4.50	Agree	Highly Satisfied
2.51 – 3.50	Moderately Agree	Moderately Satisfied
1.51 – 2.50	Disagree	Slightly Satisfied
1.00 – 1.50	Strongly Disagree	Not Satisfied

Evaluation of the Pre-service Teachers' Performance on the Instructional e-Package

In the training performance of the participants, a 60-item test was made considering the Table of Specifications. It underwent content validation by the content, language, and assessment experts. It is further streamlined into a 30-item performance test for a more reliable instrument. It then had a reliability coefficient of 0.788. The range scale of the Proficiency Level of the training performance of the pre-service teachers was adapted by Comighud et al. (2020).

Level of Proficiency	Range of Rating
Outstanding	90% - 100%
Very Satisfactory	85% - 89%
Satisfactory	80% - 84%
Fairly Satisfactory	75% - 79%
Did Not Meet Expectations	Below 75%

RESULTS AND DISCUSSIONS

The Digital Competence Needs Assessment of the Pre-service Teachers

Descriptive statistics, such as the mean and standard deviation of the pre-service teachers' responses for each digital competence item, was used. Table 1 presents the digital competence needs assessment of the pre-service teachers.

Table 1. Digital Competence Needs Assessment of the Pre-service Teachers

Indicators	Mean	SD	Descriptive Rating	Qualitative Interpretation
Information and data literacy				
I identify my needs when searching for data, information, or digital content in online environments.	3.64	0.48	Agree	Highly Competent
I use information search strategies to access data, information, and digital content in online environments	3.63	0.58	Agree	Highly Competent
I pay attention to source and citation representations when sharing data, information, or digital content.	3.51	0.63	Agree	Highly Competent
I access the data, information, and digital content I need in online environments.	3.49	0.57	Moderately Agree	Moderately Competent
I investigate from different sources whether the data, information, or digital content I access is reliable.	3.47	0.65	Moderately Agree	Moderately Competent
I critically evaluate the accuracy of the data, information, or digital content I access.	3.41	0.70	Moderately Agree	Moderately Competent
Communication and Collaboration				
I comply with behavioral norms (ethical rules) when interacting in online environments.	3.61	0.62	Agree	Highly Competent
I use digital technologies to communicate in online environments.	3.49	0.60	Moderately Agree	Moderately Competent
I use digital technologies to collaborate in online environments.	3.47	0.68	Moderately Agree	Moderately Competent
I share data, information or digital content using different digital technologies.	3.41	0.79	Moderately Agree	Moderately Competent

I easily organize and store data, information, and content in online environments.	3.24	0.65	Moderately Agree	Moderately Competent
Digital Content Creation				
I can develop content in different formats (video, visual, animation, etc.) using digital technologies	3.47	0.77	Moderately Agree	Moderately Competent
I develop content in simple forms using digital technologies.	3.47	0.65	Moderately Agree	Moderately Competent
I pay attention to copyrights and licensing when developing digital content.	3.42	0.81	Moderately Agree	Moderately Competent
I produce digital content by making changes to ready-made content.	2.95	0.92	Moderately Agree	Moderately Competent
Safety				
I am aware of the effects of digital technology use on health (physical, psychological).	3.71	0.62	Agree	Highly Competent
I protect personal data and privacy in online environments.	3.71	0.49	Agree	Highly Competent
I am aware of the environmental impact of using digital technologies.	3.69	0.56	Agree	Highly Competent
When sharing my personal information online, I take precautions to protect the personal data of others (not to tag them in a photo without permission, etc.)	3.69	0.62	Agree	Highly Competent
I take precautions about safety and privacy in online environments.	3.68	0.54	Agree	Highly Competent
I am aware of the risks and threats in online environments.	3.61	0.64	Agree	Highly Competent
I take different measures to protect my digital device and content.	3.58	0.62	Agree	Highly Competent
I know what to look out for when creating a digital identity (profile) in online environments.	3.46	0.65	Moderately Agree	Moderately Competent
I am familiar with data policies (how to use personal data) of the digital services that I am a user of (social networking, etc.)	3.44	0.62	Moderately Agree	Moderately Competent
I am aware that I leave a digital footprint when I navigate online environments.	3.41	0.70	Moderately Agree	Moderately Competent
I know how to deal with online threats.	3.03	0.85	Moderately Agree	Moderately Competent
Problem-solving				
I identify opportunities for the development of my digital competence.	3.29	0.77	Moderately Agree	Moderately Competent

I use different digital technologies to create innovative solutions.	3.29	0.77	Moderately Agree	Moderately Competent
I solve the technical problems I encounter when using digital media and devices.	3.00	0.74	Moderately Agree	Moderately Competent
I identify the causes of technical problems I encounter when using digital media and devices.	2.53	0.50	Moderately Agree	Moderately Competent
I develop my digital competence by following new developments.	2.51	0.50	Moderately Agree	Moderately Competent

As presented in the table, it can be seen that the average response of the pre-service teachers to the items in the areas of *Information and Data Literacy* and *Communication and Collaboration* was 3.2 and above. However, the items in *Digital Content Creation* and *Problem-solving* areas had a relatively lower response average than the other items. The item that states, “I produce digital content by making changes to ready-made content,” in the area of “digital content creation,” has the lowest average response. In the *Problem-solving* area, the item “I develop my digital competence by following new developments” has the lowest average response. When items related to *Safety* were assessed, it was determined that pre-service teachers are conscious of sharing their personal information. They are also aware of the risks and effects of using digital technologies. However, items on digital identity, data policies, leaving a digital footprint, and dealing with online threats in the same area had a lower response average than the other items. The item “I know how to deal with online threats” had the lowest average response. In general, when all item averages were evaluated, it can be said that pre-service teachers’ digital competence was *moderate*.

The study confirms the contention of several researchers that there is a need for digital competence as it is essential for teachers and pre-service teachers (Cabero- Almenara et al., 2021; Mercader & Gairin, 2021; Basilotta-Gómez-Pablos et al., 2022). In this field, there have been revolutionary changes in how teachers have adapted to the technological and digital era, how their digital competencies have been incorporated into the teaching and learning processes, and how their digital awareness and competencies have emerged to include lifelong learning (Garzón-Artacho et al., 2020; Garzón-Artacho et al., 2021; Karakuş & Kılıç, 2022). Similar results of the study showed that in most dimensions of digital competence, the participants were found to be moderately competent (Sathyan et al., 2022; Zhao et al., 2021). As cited by Çebi & Reisoğlu (2020), more studies revealed that pre-service teachers had a lower level of competence in digital content creation than in other digital competence areas (Napal-Fraile et al., 2018; Gutiérrez-Portlán & Serrano-Sánchez, 2016; Hinojo-Lucena et al., 2019). The same level of competence was observed in the safety and problem-solving competency areas. (Gutiérrez-Portlán & Serrano-Sánchez, 2016; Portlán & Sánchez, 2016; Esteve-Mon et al., 2020).

Based on the pre-service teachers' digital competence needs assessment result, the digital technologies or tools used in teaching Media and Information Literacy were analyzed further. These common digital tools were gathered from the previous pre-service teachers and the cooperating-teacher handling MIL. With the five (5) digital competence areas in this study, the digital technologies were grouped into three (3): data information literacy, communication and collaboration, and digital content creation. Since the two (2) areas, safety

and problem-solving, are equally significant for digital competence, it is highlighted that their competences were embedded in each digital tool. Table 2 presents the digital tools needs assessment for teaching Media and Information Literacy.

Table 2. The Digital Tools Needs Assessment of the Pre-service Teachers

Digital Tools	Mean	SD	Descriptive Rating	Qualitative Interpretation
Information and Data Literacy				
Google Meet	4.79	0.59	Very High	Exceptionally Knowledgeable
Google Classroom	4.76	0.64	Very High	Exceptionally Knowledgeable
Google Drive	4.71	0.71	Very High	Exceptionally Knowledgeable
Google Forms	4.18	1.11	High	Highly Knowledgeable
Google Sheets	3.64	1.31	High	Highly Knowledgeable
Communication and Collaboration				
Jamboard	2.19	1.39	Poor	Less Knowledgeable
Padlet	2.04	1.36	Poor	Less Knowledgeable
Mentimeter	1.87	1.18	Poor	Less Knowledgeable
Slido	1.63	0.98	Poor	Less Knowledgeable
<i>Other frequently mentioned Communication and Collaboration Tools</i>				
Kahoot				
Quizizz				
Digital Content Creation				
Google Sites	3.94	1.22	High	Highly Knowledgeable
Canva	3.69	1.35	High	Highly Knowledgeable
Google Slides	3.66	1.31	High	Highly Knowledgeable
Remove.bg	2.69	1.49	Fair	Moderately Knowledgeable
URL Shorteners	2.22	1.32	Poor	Less Knowledgeable

As can be seen in the table, the participants responded from *poor* to *very high*. This result denotes that the digital competence of the pre-service teachers ranges from *less knowledgeable* to *exceptionally knowledgeable*. It implies that participants had different perceived competency levels on the said digital tools. It is also observed that PSTs' digital competence can be enhanced through the digital tools perceived as “Less Knowledgeable” to “Highly Knowledgeable”.

Fernández-Batanero et al. (2021) argue that Higher Education, where pre-service teachers belong, is one of the educational stages most affected by digital technologies, whose constant development has produced a favorable atmosphere for new approaches regarding the teaching-learning processes. Furthermore, the study's findings show the low level of digital competence among teachers and the need for training in both technological and pedagogical areas. Furthermore, these digital tools' needs assessment attunes that there is a need for PSTs to be trained and reinforce the competence in digital content. It is pointed out that PSTs were expected to demonstrate and perform above their current digital competence, particularly in digital content development in their respective student internships (Instefjord and Munthe, 2017; Røkenes and Krumsvik, 2016).

Designing the Instructional e-Package to Enhance the Digital Competence of the PSTs

The Task Analysis Chart (TAC) was created based on the result of the needs assessment. It was content validated by the experts of the different fields of expertise on digital competence or content, language, instructional materials, and instructional systems design. It outlined the

various digital technologies the English Pre-service Teachers (PSTs) learned in the five-session online training course. In addition, each topic contained a set of expected outcomes, objectives, strategies, and activities that helped the PSTs throughout the instructional e-package. The researcher-made training design was highlighted in TAC which was the 4Rs “Reconnect”, “Rekindle”, “Refresh”, and “Reassess”. “Reconnect” serves as the motivation to start the discussion of the digital tools and the Media and Information Literacy (MIL) lesson. “Rekindle” denotes the discussion on the concept and how to utilize the digital tools, including the presentation of the tool and its demonstration. The “Refresh” part of the training design entails how the digital tools are relevant and useful to teaching MIL, which tackles and demonstrates its application integrated into the subject. Finally, “Reassess” to cap off each digital tool module is the performance tasks on the digital tools discussed and the application to MIL Lessons, highlighting that the concepts and skills be integrated into designing the participant-made instructional materials and the training output.

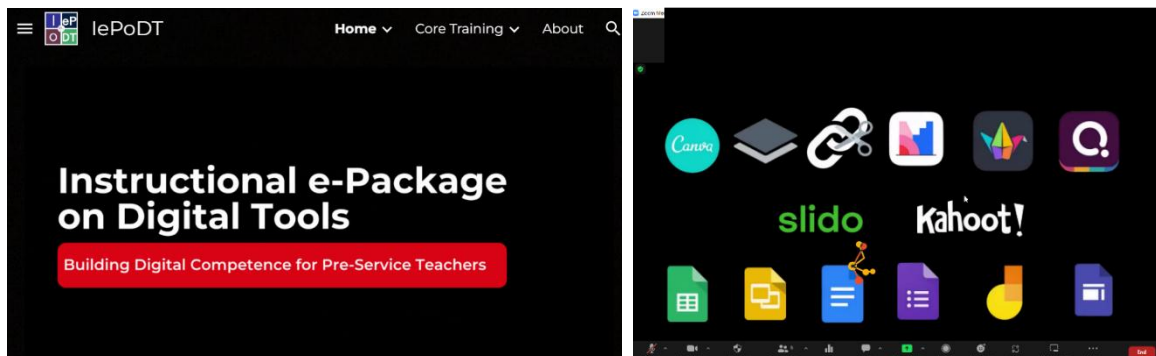
The creation of TAC supports Anuar et al.'s study (2019). The study conducted an instructional analysis. In the process, it identifies the instructional goals and performance objectiveness. The TAC supports Franzone (2009), which indicated that task analysis is the process of breaking a skill into smaller, more manageable steps to teach the skill, in the case of the present study, digital competence. The designing of programs tailored to digital competence enhancement training supports the study of Stockless et al. (2022). It mentioned that it plays a vital role in the initial training of pre-service teachers.

Moreover, it is like designing training program measures to ensure its development and advancement. It further supports the study since the mastery of information and communications technology (ICT) is always deemed necessary and has been prescriptive (Rana, 2020; Armawati et al., 2021; Stockless et al., 2022). This training program would respond to leading the learners to an engaged learning environment (Segumpan & Tan, 2018; Stephenson et al., 2020; Segumpan, 2021).

Developing the Instructional e -Package for Preservice Teachers

Google Sites was utilized as the platform of the courseware. The instructional e-package contained input regarding the digital tools identified during the needs assessment. These tools would be used in teaching Media and Information Literacy. Further, these digital technologies were grouped based on the digital competence framework of EU Science Hub (DigComp) to develop the lacking digital competences of the preservice teachers. Each digital tool has the relevant competencies in safety and problem-solving that are relevant to each tool. The design blueprint was the task analysis chart created in the design stage. The courseware for the instructional e-package was made sure to have user-friendly and cross-platform navigation, including mobile phones, tablets, and even large screens. Figure 1 shows the snippets of the courseware, including during the implementation of the instructional e-package.

Figure 1. The snippets of the instructional e-package



In the development process, the training activities and materials were selected. The learning events, activities, instructional management plan, and delivery system were specified. The platform for the online training was Zoom videoconferencing app. The courseware underwent content validation by experts. It had a try-out with the previous pre-service teachers teaching MIL. The try-out participants suggested enriching the performance task part of the module. The suggestions from the experts and try-out participants were incorporated into the instructional e-package.

The courseware contained three (3) tabs on the website. It includes *Home*, *Core Training*, and *About*. In the *Home* tab, the subpages were *Start Here: Introduction of the Training* and the *Training Design*. In the *Core Training*, the pages were grouped into three (3) training packettes: *Information and Data Literacy*, *Communication and Collaboration*, and *Digital Content Creation*. Training Packette One had three (3) modules: *Google Forms*, *Google Sheets*, and *Google Docs*. Training Packette Two had six (6) modules: *Menti.com*, *Jamboard*, *Padlet*, *Slido*, *Kahoot*, and *Quizizz*. Training Packette Three had five (5) modules: *Canva*, *Google Sites*, *Google Slides*, *Remove.bg*, and *URL shorteners*.

Safety and problem-solving competences were embedded in each digital tool's *Refresh* part of the training module. It emphasized the safety net and accountability in utilizing the digital tool, such as considering securing the account, leaving the digital footprint online, and the netiquette to avoid online bullying. The module also discussed ways to maximize the technology in creating potential innovative solutions for the class. It also offered methods of checking every possibility when devices will not work for the digital tool. Among the ways of managing technical glitches is to check the internet connectivity, account credentials, and device incompatibility. As previously presented, these were the competences in safety and problem-solving that pre-service teachers were found to be *moderately competent*.

Distinguished experts in the field evaluated the courseware through an instrument adapted from Alava (2017). Table 3 displays the evaluation of the experts on the courseware objectives.

Table 3. Experts' Evaluation of the Courseware for the Instructional e-Package

Indicator	Mean	SD	Descriptive Rating	Qualitative Interpretation
A. Courseware Objectives	5.00	0.00	Strongly Agree	Extremely Satisfied
1. The objectives of the courseware are clearly stated, easy to follow, and achieve.	5.00	0.00	Strongly Agree	Extremely Satisfied
2. The objectives of the courseware are relevant and sufficient to meet the participants' needs, especially on digital competence through skills in digital tools.	5.00	0.00	Strongly Agree	Extremely Satisfied
3. The objectives of the courseware are relevant to the present duties of the participants as pre-service teachers or soon-to-be teachers.	5.00	0.00	Strongly Agree	Extremely Satisfied
B. Courseware Accuracy	4.80	0.20	Strongly Agree	Extremely Satisfied
1. The information on the courseware is accurate.	4.80	0.45	Strongly Agree	Extremely Satisfied
2. The spelling and grammar of the courseware are correct.	5.00	0.00	Strongly Agree	Extremely Satisfied
3. The courseware has a bibliography or reference for borrowed material.	4.60	0.55	Strongly Agree	Extremely Satisfied
C. Courseware Content	4.80	0.20	Strongly Agree	Extremely Satisfied
1. The content on digital tools is sufficient to help the participants develop their digital competence and knowledge, as reflected in the training's theme, objectives, and Media and Information Literacy topics.	4.80	0.45	Strongly Agree	Extremely Satisfied
2. The content on digital tools is sufficient to help the participants become aware and skilled in the digital tools needed for teaching to improve themselves through the training materials presented.	4.60	0.55	Strongly Agree	Extremely Satisfied
3. The digital tools topics and contents are sufficient to help the participants to update their knowledge on the topics/subject matter taken up (on enhancing digital tools/digital competence for Media and Information Literacy)	5.00	0.00	Strongly Agree	Extremely Satisfied
D. Courseware Technicality	4.75	0.10	Strongly Agree	Extremely Satisfied
1. The website is friendly and easy to navigate.	4.80	0.45	Strongly Agree	Extremely Satisfied
2. Menus and digital tools content	4.80	0.45	Strongly Agree	Extremely Satisfied

are arranged consistently across every page on the courseware.

3.	The color choice is used consistently to reflect the theme of the website.	4.80	0.45	Strongly Agree	Extremely Satisfied
4	The courseware has depth and breadth relevant to the training.	4.60	0.55	Strongly Agree	Extremely Satisfied
Overall		4.83	0.25	Strongly Agree	Extremely Satisfied

The table shows that the experts evaluated the objectives as the highest and the technicality as the lowest. However, their rating in all four (4) areas indicates that the criteria were *extremely satisfied*. The result of this evaluation supports the experts' comment that the courseware is excellent. Also, they commented that the courseware is "*Splendid*."

Developing the courseware for the digital competence of pre-service teachers is similar to the study of Yelubay et al. (2022). The study underscored that the relevance of developing future teachers' digital competence was associated with their insufficient knowledge and skills, which was reflected during the diagnostic stage analysis in using digital and network technologies in the educational process. This study is similar to Muruganatham's (2015) research, which also developed an e-content package using the ADDIE model. He expressed in his study that the e-content packages tend to deploy the media creatively and productively and restructure education to respond constructively and progressively to technological and social change. The learning materials designed and developed based on technology facilitated the learners to achieve better performance. It is noted that the development of an e-content package is a unique learning tool at its own pace and visualizing the content. This study also supports the study of Villamayor (2016), which developed an instructional e-package for pre-service teachers. In addition, she developed an experiential learning mathematics package using the ADDIE model.

The courseware evaluation result also corroborates Anuar et al.'s (2019) study. The findings revealed that the courseware indicated satisfactory and appropriate practices of artistic skills for Art students to improve their personal skills. Unlike the present study, the courseware was developed based on Dick and Carey's instructional design model to address instruction as an entire system and focus on the inter-relationship between various factors such as context, content learning, and instruction. Similar to the study, the courseware was also evaluated using a questionnaire with a 5-point Likert scale. However, the previous research differs in that it dealt with the elements of interface design, content, artistic skills practice, and the usability of the courseware.

Implementing the Instructional e- Package for Pre-service Teachers

The experts evaluated the instructional e-package with its implementation to the pre-service teachers. They had given a maximum response average on the items of the evaluation instrument. Table 4 presents the experts' evaluation of the implementation of the instructional e-package.

Table 4. Evaluation of Experts in the Implementation of the Instructional e-Package

Indicators	Mean	Descriptive Rating	Qualitative Interpretation
A. Training Objectives	5.00	Strongly Agree	Extremely Satisfied
1. The objectives are clearly	5.00	Strongly Agree	Extremely Satisfied

	stated and easy to follow and achieve.			
2.	The objectives are relevant and sufficient to meet the participants' needs, especially digital competence.	5.00	Strongly Agree	Extremely Satisfied
3.	The objectives are consistent with the theme of the training activity.	5.00	Strongly Agree	Extremely Satisfied
B.	Training Topics and Activities	5.00	Strongly Agree	Extremely Satisfied
1.	The topics and activities are sufficient to help the participants develop their digital competence in the subject.	5.00	Strongly Agree	Extremely Satisfied
2.	The topics and activities are adequate to develop participants' skills in digital tools.	5.00	Strongly Agree	Extremely Satisfied
3.	The topics and activities are appropriate to improve participants' knowledge of digital tools.	5.00	Strongly Agree	Extremely Satisfied
4.	The topics and activities are sufficient to help the participants become skilled in the digital tools needed for teaching.	5.00	Strongly Agree	Extremely Satisfied
5.	The topics and activities are sufficient to help the participants to update their knowledge of Media and Information Literacy.	5.00	Strongly Agree	Extremely Satisfied
C.	Training Resource Person	5.00	Strongly Agree	Extremely Satisfied
1.	The resource person's mastery of the topic is observed in the conduct of training.	5.00	Strongly Agree	Extremely Satisfied
2.	The resource person's communication skill is fluently manifested.	5.00	Strongly Agree	Extremely Satisfied
3.	The resource person can address questions and clarifications from the participants.	5.00	Strongly Agree	Extremely Satisfied
4.	The resource person is creative with her presentation techniques and methodology in training.	5.00	Strongly Agree	Extremely Satisfied
D.	Training Overall Technicality	5.00	Strongly Agree	Extremely Satisfied

1.	The training design is consistent with the theme.	5.00	Strongly Agree	Extremely Satisfied
2.	Needs analysis was done to guide to assess the digital competence and choosing digital tools and activities for training.	5.00	Strongly Agree	Extremely Satisfied
3.	The schedule of activities is feasible for both flexible and face-to-face learning modalities.	5.00	Strongly Agree	Extremely Satisfied
4.	The time frame and pacing of activities are adequate and reasonable.	5.00	Strongly Agree	Extremely Satisfied
5.	The topics and activities are sequentially and logically arranged.	5.00	Strongly Agree	Extremely Satisfied
6.	The topics are relevant, engaging, and well-organized.	5.00	Strongly Agree	Extremely Satisfied
7.	Preliminaries such as opening program, registration, and post-training evaluation are included.	5.00	Strongly Agree	Extremely Satisfied
8.	A closing/culminating program is conducted.	5.00	Strongly Agree	Extremely Satisfied
9.	The participants are provided with research instrument tools for evaluating the training.	5.00	Strongly Agree	Extremely Satisfied
10.	Generally, the conduct and implementation of the training are efficient.	5.00	Strongly Agree	Extremely Satisfied
Overall		5.00	Strongly Agree	Extremely Satisfied

As presented in the table, the experts evaluated the training objectives, training topics and activities, training resource person, and training overall technicality with a maximum score. The result supports an expert's comment on the instructional e-package: "A tremendous congratulations for the success of your implementation of the training package. It gives a wide scope in teaching and learning processes to guide PSTs in utilizing technologies compellingly to improve their educational competency and effectivity."

From the pre-service teachers' point of view, the training is very important, especially during this time of pandemic. Below is the comment given by a participant:

What I like the most is the training itself as it prepares the student teachers for the future of teaching by utilizing different digital tools that can make their teaching job easier and interactive, whether online or in a traditional context. Because we do not necessarily utilize digital tools in post-pandemic. We already utilized it pre-pandemic, but here at this time, it was given the utmost importance as it is the only means of safer and more accessible means

of mode of learning. Even if you have only in you is a phone, you can join or conduct your instructions using digital tools. The digital tools that I have learned.

This study's result supports Villamayor (2016) and Alava (2017), where various experts agree that the instructional e-package was adequate in developing the knowledge and skills of the participants. The experts' rating on the instructional e-package is parallel to a shared insight by an expert that digital competence training is a relevant and key element for teaching.

Evaluating the Effectiveness of the Instructional e-Package for Pre-service Teachers

Pre-service Teachers' Performance in the Instructional e-package

The data collected were analyzed using descriptive statistics, specifically the frequency, percent distribution, mean, and standard deviation. A pre-test before the training and a post-test after the instructional e-package on digital tools were administered to assess the participants' performance levels. The data in Table 5 show the participants' level of training performance in the pre-test and the post-test.

Table 5. Pre-Service Teachers' Performance in the Instructional e-Package

Level of Proficiency	Range of Rating	Pretest		Posttest	
		f	%	f	%
Outstanding (O)	90% - 100%	0	0.00%	19	42.22%
Very Satisfactory (VS)	85% - 89%	0	0.00%	4	8.89%
Satisfactory (S)	80% - 84%	1	2.22%	6	13.33%
Fairly Satisfactory (FS)	75% - 79%	1	2.22%	2	4.44%
Did Not Meet Expectations (DNME)	Below 75%	43	95.56%	14	31.11%
x		55.70		80.37	
SD		11.12		18.75	
QD		DNME		S	

As presented in the table, the pre-test rating indicates that almost all participants obtained the level that *did not meet expectation*, as 43 or 95.56% got a rating below 75%. Only one (1), or 2.22% of the participants, reached the *satisfactory* level of proficiency. Similarly, only one (1), or 2.22% of the participants, had a *fairly satisfactory* proficiency level. No participant reached *outstanding* and *very satisfactory* levels of proficiency. It can also be noted that there was a variation in the distribution of the participants' ratings in the pre-test. Looking at the profile, the cluster of the pre-test rating of the participants *did not meet expectation* proficiency level. It had a mean rating of 55.70 and a standard deviation of 11.12.

After implementing the instructional e-package, the post-test ratings of the participants attained a greater mean. The distribution of the rating was as follows: 19 participants or 42.22% of the participants were *outstanding*; 4 participants, or 8.89%, were *very satisfactory*; 6 participants, or 13.33%, were *satisfactory*; two (2) participants or 4.44% were *fairly satisfactory*, and 14 participants or 31.11% reached *did not meet expectation* proficiency level.

It is noted that after the training implementation, the participants' ratings during the post-test reached a *satisfactory* level of proficiency. It had a mean rating of 80.37 and a standard deviation of 18.75. The standard deviation showed variation in the distribution of the participants' ratings in both the pre-test and post-test. The result manifests that there was an increase in the training performances of the participants. Based on the mean, the participants'

performance improved. This result strongly established the effectiveness of the training in developing the digital competence of the pre-service teachers. The mean rating of the participants, before and after the implementation of the e-package, could attest that their training performances had improved.

The result of the study supports the study of Reisoğlu (2021), where the study found that the training on digital competence enhanced the knowledge and skills of the teachers, particularly in the areas of improving professional engagement, using digital resources, organizing teaching activities, improving assessments, and empowering learners. Moreover, the study's result also adheres to Reisoğlu & Çebi (2020) study. The study revealed that digital competence training must be implemented effectively in which pre-service teachers collaborate on digital issues regardless of their previous experience.

In this study, the training performance of the pre-service teachers had a significant difference before and after the implementation of the e-package. Table 6 presents the Paired-Samples T-test Summary Table for their training performance.

Table 6. Paired-Samples T-test Summary Table for the Performance of Pre-service Teachers

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pretest	-24.69	18.48	2.76	-30.24	-19.14	-8.96	44	.000
Post-test								

Based on the result, there is a significant difference in the performance of the pre-service teachers in favor of the instructional e-package implemented. It has a p-value of $p = .000$, with a 0.05 level of confidence. It depicts a significant improvement in the training performance of the PSTs. This result affirmed the study of Çebi and Reisoğlu(2022), which revealed that the teachers' knowledge and skills were improved by having training in digital competence, particularly in the areas of enhancing professional engagement, utilizing digital resources, planning lessons, enhancing evaluations, and empowering students. In this present study, the participants also cited their engagement in training and highlighted some of the factors they opted for: "The applications discussed like Canva and Kahoot. It is indeed a helpful tool especially that we are future educators. Also, the use of technology as an aid to this new-normal setting is a proof that both teachers and students are capable of being flexible enough."

Another participant expressed how the instructional e-package boosted her digital competence. She said,

"the training practically boosted my digital competence as a teacher, because before we started the training, I did not know about these tools, these platforms discussed in the training. I only knew Canva but because of the training I know the assessment tools that can be used in teaching. I know different platforms, and I think I will really be able to use them in my future teaching job."

Pre-service Teachers' Evaluation in the Instructional e-Package Implementation

As evaluation is evident in every facet of this study, the participants also evaluated the instructional e-package. The evaluation commenced after the Closing Program, which signifies that the training has been concluded. Table 7 shows the post-evaluation of the pre-service teachers in the instructional e-package.

Table 7. Evaluation of the Instructional e-Package Implementation by the Pre-service Teachers

Indicator	Mean	SD	Descriptive Rating	Qualitative Interpretation
A. PRELIMINARIES OF THE TRAINING	4.89	0.03	Strongly Agree	Extremely Satisfied
1. Preparation of the training was adequate and satisfactory.	4.89	0.31	Strongly Agree	Extremely Satisfied
2. Coordination was evident in the conduct of the training.	4.85	0.36	Strongly Agree	Extremely Satisfied
3. Materials and resources given out ahead of time were sufficient to help the trainer meet the needs of the participants in the training.	4.87	0.34	Strongly Agree	Extremely Satisfied
4. The online registration was systematic, efficient, and organized.	4.93	0.26	Strongly Agree	Extremely Satisfied
5. The online attendance in each session was easy to navigate.	4.91	0.29	Strongly Agree	Extremely Satisfied
B. TRAINING PROGRAM	4.87	0.05	Strongly Agree	Extremely Satisfied
1. The program was well organized.	4.93	0.26	Strongly Agree	Extremely Satisfied
2. The training sessions started at the scheduled time.	4.82	0.43	Strongly Agree	Extremely Satisfied
3. Time was maximized and optimized by the speaker and facilitators.	4.84	0.37	Strongly Agree	Extremely Satisfied
4. The schedule of the training was flexible.	4.85	0.40	Strongly Agree	Extremely Satisfied
5. Time is enough to cover all topics with in-depth discussion.	4.91	0.35	Strongly Agree	Extremely Satisfied
C. COURSE CONTENT	4.90	0.03	Strongly Agree	Extremely Satisfied
1. The objectives of the training were clearly defined.	4.95	0.23	Strongly Agree	Extremely Satisfied
2. Content met stated objectives.	4.87	0.39	Strongly Agree	Extremely Satisfied
3. The content met my needs, especially in enhancing my knowledge and skills in digital competence.	4.85	0.40	Strongly Agree	Extremely Satisfied
4. The course content was relevant and important in teaching Media and Information Literacy.	4.89	0.31	Strongly Agree	Extremely Satisfied
5. The content is grammatically correct.	4.95	0.23	Strongly Agree	Extremely Satisfied

6.	The content presented was applicable to my teaching field.	4.91	0.29	Strongly Agree	Extremely Satisfied
7.	The expectations of the training were attained.	4.87	0.34	Strongly Agree	Extremely Satisfied
8.	The length of the lecture and demonstration was adequate.	4.85	0.40	Strongly Agree	Extremely Satisfied
9.	The instructional e-material output required in training was generally applicable.	4.89	0.37	Strongly Agree	Extremely Satisfied
10	The training broadened my knowledge of the digital tools' topics discussed.	4.93	0.26	Strongly Agree	Extremely Satisfied
D. TECHNICALITY		4.84	0.11	Strongly Agree	Extremely Satisfied
1.	The online venue was relevant and accessible.	4.65	0.58	Strongly Agree	Extremely Satisfied
2.	The presentation materials and technical equipment were utilized well for the training.	4.80	0.45	Strongly Agree	Extremely Satisfied
3.	Appropriate forms of media are used to enhance the presentation in training.	4.93	0.26	Strongly Agree	Extremely Satisfied
4	The multimedia presentations used in training have a coherent layout, design, and background.	4.89	0.31	Strongly Agree	Extremely Satisfied
5.	The training was technically prepared.	4.91	0.29	Strongly Agree	Extremely Satisfied
E. RESOURCE PERSON		4.93	0.01	Strongly Agree	Extremely Satisfied
1.	Knowledge of the subject matter is observed in training.	4.93	0.26	Strongly Agree	Extremely Satisfied
2.	The delivery and the presentation of the speaker were clear and organized.	4.93	0.26	Strongly Agree	Extremely Satisfied
3.	The technical equipment and digital tools are utilized well by the speaker.	4.91	0.29	Strongly Agree	Extremely Satisfied
4.	The speaker is responsive to the questions and concerns of the participants in the training.	4.91	0.35	Strongly Agree	Extremely Satisfied
5.	The speaker established a good rapport with the participants.	4.95	0.23	Strongly Agree	Extremely Satisfied
6.	The speaker shared the novelty and usefulness of digital tools in teaching Media and Information Literacy.	4.95	0.23	Strongly Agree	Extremely Satisfied
7.	The speaker discussed and demonstrated in training were lively and engaging.	4.93	0.33	Strongly Agree	Extremely Satisfied
F. PARTICIPANTS' ENGAGEMENT		4.85	0.06	Strongly Agree	Extremely Satisfied
1.	Participation and interaction were encouraged.	4.89	0.31	Strongly Agree	Extremely Satisfied
2.	Participants participated in the discussion and activities.	4.80	0.40	Strongly Agree	Extremely Satisfied

3	Participants displayed confidence during the presentation of the outputs.	4.76	0.43	Strongly Agree	Extremely Satisfied
4.	As a participant, I will try my best to apply what I learned in training to the best I can.	4.87	0.34	Strongly Agree	Extremely Satisfied
5.	As a participant, I will recommend this training to my friends and other pre-service teachers.	4.91	0.29	Strongly Agree	Extremely Satisfied
Overall		4.88	0.06	Strongly Agree	Extremely Satisfied

The participants expressed positive regard for the training, as presented in the table. In fact, the lowest mean score is *Technicality*, and the highest of their evaluation is *Resource Speaker*. All of the areas in training had a rating of *strongly agree* in the participants' perspective, meaning they were *extremely satisfied* with the instructional e-package.

The study's results affirmed the study of Milutinović (2020), where the results revealed a positive impact on pre-service teachers' perceived usefulness, perceived ease of use, and digital competencies in their intention to use digital technology in future teaching. Moreover, it was revealed in the present study that the Resource Person had the Highest Mean Score. This finding supports Reisoğlu & Çebi (2020) study that trainers should structure their training courses so that pre-service teachers can see them as role models. A participant observed the speaker's interaction with the participants and the digital tools they liked best in training and commented, "*The interaction from the researcher to the respondents. The integration of interactive digital tools. The knowledge of the digital tools used for learning and how to integrate them to the discussion make the learning more fun and interactive. Another participant also added what she likes in training "I like the most is when the speaker tries to relate the discussed digital tools to the usefulness in teaching."*

Experts' Evaluation of the Participant-made Instructional Materials

The participants' digital competence assessment was evident in their training outputs. Table 8 presents the evaluation of the participant-made instructional materials by the pool of experts.

Table 8. Experts' Evaluation of the Participant-made Instructional Materials

Indicators	Mean	SD	Descriptive Rating	Qualitative Interpretation
A. Content and Content Accuracy	4.94	0.13	Strongly Agree	Extremely Satisfied
1. The instructional e-material covers Media and Information Literacy topics and its relevant digital competence skills for the learners.	5.00	0.00	Strongly Agree	Extremely Satisfied
2. The instructional e-material shows the lesson logically.	5.00	0.00	Strongly Agree	Extremely Satisfied
3. The instructional e-material presents the lesson engagingly.	4.75	0.50	Strongly Agree	Extremely Satisfied
4. The instructional e-material contains digital tools for learners' engagement.	5.00	0.00	Strongly Agree	Extremely Satisfied
B. Technicality and Clarity	4.95	0.11	Strongly Agree	Extremely Satisfied

1.	The instructional e-material contains graphics and illustrations that will enhance learners' understanding.	5.00	0.00	Strongly Agree	Extremely Satisfied
2.	The instructional e-material presents ideas in a well-organized and logical format.	5.00	0.00	Strongly Agree	Extremely Satisfied
3.	The instructional e-material presents in straightforward language.	5.00	0.00	Strongly Agree	Extremely Satisfied
4.	The instructional e-material contains instructions that are clear and easy to understand.	4.75	0.50	Strongly Agree	Extremely Satisfied
5.	The instructional e-material contains texts and elements suited to the learners' level of understanding.	5.00	0.00	Strongly Agree	Extremely Satisfied
C.	Relevance	4.83	0.14	Strongly Agree	Extremely Satisfied
1.	The instructional e-material texts and other elements are relevant to developing digital competence skills.	5.00	0.00	Strongly Agree	Extremely Satisfied
2.	The instructional e-material texts and other elements are relevant to digital competence and real-life experiences.	4.75	0.50	Strongly Agree	Extremely Satisfied
3.	The instructional e-material texts and other elements are relevant to incorporating the digital tools in Media and Information Literacy topics.	4.75	0.50	Strongly Agree	Extremely Satisfied
D.	Appropriateness	4.88	0.14	Strongly Agree	Extremely Satisfied
1.	The instructional e-material is appropriate in the learning of the digital tools needed for Media and Information Literacy	5.00	0.00	Strongly Agree	Extremely Satisfied
2.	The instructional e-material reinforces the digital competence of teaching and learning.	4.75	0.50	Strongly Agree	Extremely Satisfied
3.	The instructional e-material allows the learners to perform tasks in an independently paced manner.	5.00	0.00	Strongly Agree	Extremely Satisfied
4.	The instructional e-material accommodates varied levels of learners' mental ability.	4.75	0.50	Strongly Agree	Extremely Satisfied
Overall		4.91	0.13	Strongly Agree	Extremely Satisfied

The evaluation presented in the table entails that the experts responded with *strongly agree*. This means that all indicators in all areas of the said evaluation were *extremely satisfied* by the training outputs of the participants. As presented in the table, the highest mean score of the constructs for the participant-made instructional material is *Technicality and Clarity*. At the same time, the least scored area is *Relevance*. Still, all the constructs have a descriptive rating of *strongly agree* which depicts that the experts were *extremely satisfied* with the instructional materials of the participants as their output of the training.

The result of this study also supports the ISD study of Villamayor (2016) and Alava (2017). In their studies, experts found the output of the participants as adequate in training. In the present study, experts had positive feedback on the output of the participants and viewed it as "Nice output and content." However, there were also participant-produced instructional materials that were given some suggestions and recommendations to improve further. One expert suggested, "Provide explicit instruction to Let's Try section." "Please improve on the color scheme and contrast." Other suggestions given were, "Be consistent in your font styles and colors," "Utilize graphics to make your IM more engaging," and "Use URL shortener or QR code generator for easier access to the site." The experts also commented on incorporating assessment at the end and varying the difficulty of the tasks on the instructional material. They stated, "You can incorporate assessment in the end" and "Sample task with varying level of difficulty maybe presented." In addition, the experts also highlighted that the IMs produced should use gender-inclusive language. They further suggested the inclusion of pictures of both males and females for gender-fair representation. They emphasized that it has to be ensured that gender representation is not biased.

CONCLUSIONS

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

1. Before the training using the instructional e-package, the PSTs were moderately competent in using digital tools and lacked the competencies in using these tools in teaching MIL.
2. The Task Analysis Chart that was constructed based on the needs assessment of the PSTs was content validated and adequate as the blueprint for the instructional e-package courseware development.
3. The courseware is highly adequate for building the PSTs' DC through digital tools. This is evident in the experts' courseware evaluation, indicating that all criteria were extremely satisfied.
4. The implementation of the instructional e-package was highly adequate. This is indicated evaluation of the pool of experts, showing that the indicators of the enhancement of the DC of the PSTs in teaching MIL were extremely satisfied.
5. The instructional e-package on the digital tools effectively builds the DC of the PSTs in teaching MIL. PSTs found the instructional e-package highly adequate to enhance their digital competence. The experts also found the training output highly adequate. Hence, the instructional e-package boosts and builds the PSTs' digital competence.

ACKNOWLEDGEMENT

The researchers expressed fervent gratitude to Central Mindanao University for allowing the conduct and for the study leave grant for the completion of this study. Also, to Bukidnon State University, particularly the Doctor of Philosophy in Education major in Instructional Systems Design, for directing the path of this research as its completion is a requirement of the program, Also, for the Commission on Higher Education Scholarships for Instructors' Knowledge Advancement Program (CHED SIKAP), for the opportunity of being a full-time grant scholar. To families and friends for support and inspiration. Finally, to Almighty, for the divine grace, mercy, and providence and for making this endeavor possible.

REFERENCES

- i. Admiraal, W., van Vugt, F., Kranenburg, F., Koster, B., Smit, B., Weijers, S., & Lockhorst, D. (2016). Preparing pre-service teachers to integrate technology into K–12 instruction: Evaluation of a technology-infused approach. *Technology, Pedagogy and Education*, 26(1), 105-120. <https://doi.org/10.1080/1475939x.2016.1163283>
- ii. Alava, W. Jr. (2017). Learning package for pre-service teachers to develop lesson plans in biology using ASSURE model. [Unpublished doctoral dissertation]. Bukidnon State University.
- iii. Al-Tawisi, B., Hamed, S., & Al-Banna, N. (2016). Public policy paper: Media and information literacy in Jordan: Needs and opportunities.
- iv. Al Zou'bi, R. M. (2022). The impact of media and information literacy on students' acquisition of the skills needed to detect fake news. *Journal of Media Literacy Education*, 14(2), 58-71. <https://doi.org/10.23860/jmle-2022-14-2-5>
- v. Anuar, R., Zainal Abidin, S., & Wan Zakaria, W. Z. (2019). The design, development and evaluation of tpsack courseware to facilitate the art and design education students artistic skills knowledge. *Asian Journal of University Education*, 15(3), 69. <https://doi.org/10.24191/ajue.v15i3.7561>
- vi. Armawati, Ahmad, S., & Destiniar. (2021). The effect of information technology mastery and job motivation on the productivity of elementary school teachers in the Semidang Aji district. *Advances in Social Science, Education and Humanities Research*. <https://doi.org/10.2991/assehr.k.210716.293>
- vii. Asio, J. M. (2021). Spearheading education during the COVID-19 rife: Administrators level of digital competence and schools readiness on distance learning. *Journal of Pedagogical Sociology and Psychology*, 3(1), 19-26. <https://doi.org/10.33902/jpsp.2021364728>
- viii. Barrera, K. I., Jaminal, B., & Arcilla, F. J. (2020). Readiness for flexible learning amidst COVID 19 pandemic of Saint Michael college of Caraga, Philippines. *SMCC Higher Education Research Journal*, 2(1). <https://doi.org/10.18868/cte.02.060120.01>
- ix. Basilotta-Gómez-Pablos, V., Matarranz, M., Casado-Aranda, L., & Otto, A. (2022). Teachers' digital competencies in higher education: A systematic literature review. *International Journal of Educational Technology in Higher Education*, 19(1). <https://doi.org/10.1186/s41239-021-00312-8>
- x. Batane, T., & Ngwako, A. (2017). Technology use by preservice teachers during teaching practice: Are new teachers embracing technology right away in their first teaching experience? *Australasian Journal of Educational Technology*. <https://doi.org/10.14742/ajet.2299>
- xi. Bautista Jr, A. (2021). Teaching media and information literacy in Philippine senior high schools: Strategies used and challenges faced by selected teachers. *Asian Journal on Perspectives in Education*.
- xii. Beltran, J. (2018). Examining the effects of the application of a student response system in teaching media & information literacy to senior high school students: A micro-research proposal. *Online Submission*.
- xiii. Cabero-Almenara, J., Romero-Tena, R., & Palacios-Rodríguez, A. (2020). Evaluation of teacher digital competence frameworks through expert judgement: The use of the expert

- competence coefficient. *Journal of New Approaches in Educational Research*, 9(2), 275. <https://doi.org/10.7821/naer.2020.7.578>
- xiv. Cahapay, M. B., & Rotas, E. (2022). Remote learning stress, adaptive coping strategies, and academic performance of Filipino university students amid COVID-19 crisis. *Computers and Children*, 1(1), em001. <https://doi.org/10.29333/cac/11823>
- xv. Casacchia, M., Cifone, G., Giusti, L., Fabiani, L., Gatto, R., Lancia, L., Cinque, B., Petrucci, C., Giannoni, M., Ippoliti, R., Frattaroli, A. R., Macchiarelli, G., & Roncone, R. (2021). Distance education during COVID 19: An Italian survey on the university teachers' perspectives and their emotional conditions. *BMC Medical Education*, 21(1). <https://doi.org/10.1186/s12909-021-02780-y>
- xvi. Çebi, A., & Reisoğlu, İ. (2020). Digital competence: A study from the perspective of preservice teachers in Turkey. *Journal of New Approaches in Educational Research*, 9(2), 294. <https://doi.org/10.7821/naer.2020.7.583>
- xvii. Çebi, A., & Reisoğlu, İ. (2022). Defining “digitally competent teacher”: An examination of preservice teachers' metaphor. *Journal of Digital Learning in Teacher Education*, 38(4), 185-198. <https://doi.org/10.1080/21532974.2022.2098210>
- xviii. Chen, V., Sandford, A., LaGrone, M., Charbonneau, K., Kong, J., & Ragavaloo, S. (2022). An exploration of instructors' and students' perspectives on remote delivery of courses during the COVID- 19 pandemic. *British Journal of Educational Technology*, 53(3), 512-533. <https://doi.org/10.1111/bjet.13205>
- xix. Comighud, S. M. T., Pillado, I. A., & Futralana, M. C. Z., & (2020). Factors on memory retention: Effect to students' academic performance.
- xx. Esteve-Mon, F. M., Ángeles Llopis, & Adell-Segura, J. (2020). Digital competence and computational thinking of student teachers. *International Journal of Emerging Technologies in Learning (iJET)*, 15(02), 29–29. <https://doi.org/10.3991/ijet.v15i02.11588>
- xxi. Evagorou, M., & Nisiforou, E. (2020). Engaging preservice teachers in an online STEM fair during COVID-19. *Journal of Technology and Teacher Education*, 28(2), 179-186.
- xxii. Fernández-Batanero, J. M., Román-Graván, P., Montenegro-Rueda, M., López-Meneses, E., & Fernández-Cerero, J. (2021). Digital teaching competence in higher education: A systematic review. *Education Sciences*, 11(11), 689.
- xxiii. Franzone, E. (2009). Steps for implementation: Functional communication training. Madison, WI: The National Professional Development Center on Autism Spectrum Disorders, Waisman Center, University of Wisconsin.
- xxiv. Garzón Artacho, E., Martínez, T. S., Ortega Martín, J. L., Marín Marín, J. A., & Gómez García, G. (2020). Teacher training in lifelong learning—The importance of digital competence in the encouragement of teaching innovation. *Sustainability*, 12(7), 2852. <https://doi.org/10.3390/su12072852>
- xxv. Garzón-Artacho, E., Sola-Martínez, T., Romero-Rodríguez, J., & Gómez-García, G. (2021). Teachers' perceptions of digital competence at the lifelong learning stage. *Heliyon*, 7(7), e07513. <https://doi.org/10.1016/j.heliyon.2021.e07513>
- xxvi. Ghavifekr, S., & Rosdy, W. A. (2015). Teaching and learning with technology: Effectiveness of ICT integration in schools. *International Journal of Research in Education and Science*, 1(2), 175. <https://doi.org/10.21890/ijres.23596>

- xxvii. Grand-Clement, S., Devaux, A., Belanger, J., & Manville, C. (2017). Digital learning: Education and skills in the digital age. <https://doi.org/10.7249/cf369>
- xxviii. Gretter, S., & Yadav, A. (2018). What do Preservice teachers think about teaching media literacy?: An exploratory study using the theory of planned behavior. *Journal of Media Literacy Education*, 10(1), 104-123. <https://doi.org/10.23860/jmle-2018-10-1-6>
- xxix. Gutiérrez Porlán, I., & Serrano Sánchez, J. L. (2016). Evaluación Y desarrollo de la competencia digital de futuros maestros en la Universidad de Murcia. *Journal of New Approaches in Educational Research*, 6(1), 51-56. <https://doi.org/10.7821/naer.2016.1.152>
- xxx. Han, I., Shin, W. S., & Ko, Y. (2017). The effect of student teaching experience and teacher beliefs on preservice teachers' self-efficacy and intention to use technology in teaching. *Teachers and Teaching*, 23(7), 829-842. <https://doi.org/10.1080/13540602.2017.1322057>
- xxxi. Hinojo-Lucena, F. J., Aznar-Díaz, I., Cáceres-Reche, M. P., Trujillo-Torres, J. M., & Romero-Rodríguez, J. M. (2019). Factors influencing the development of digital competence in teachers: Analysis of the teaching staff of permanent education centres. *IEEE Access*, 7, 178744–178752. <http://doi.org/10.1109/ACCESS.2019.2957438>.
- xxxii. Instefjord, E. J., & Munthe, E. (2017). Educating digitally competent teachers: A study of integration of professional digital competence in teacher education. *Teaching and Teacher Education*, 67, 37-45. <https://doi.org/10.1016/j.tate.2017.05.016>
- xxxiii. Joaquin, J. J., Biana, H. T., & Dacela, M. A. (2020). The Philippine higher education sector in the time of COVID-19. *Frontiers in Education*, 5. <https://doi.org/10.3389/feduc.2020.576371>
- xxxiv. Karakuş, İ., & Kılıç, F. (2022). 'Digital' overview at the profiles of preservice teachers: Digital awareness, competence and fluency. *Problems of Education in the 21st Century*, 80(2), 324-338. <https://doi.org/10.33225/pec/22.80.324>
- xxxv. Kwaah, C. Y., Adu-Yeboah, C., Amuah, E., Essilfie, G., & Somuah, B. A. (2022). Exploring preservice teachers' digital skills, stress, and coping strategies during online lessons amid COVID-19 pandemic in Ghana. *Cogent Education*, 9(1). <https://doi.org/10.1080/2331186x.2022.2107292>
- xxxvi. Labangon, D., Zabala, J. (2018). Towards a literate studentry: Media and information literacy implementation in the Philippines. In *17th Congress of Southeast Asian Librarians. Naypyitaw, Myanmar*.
- xxxvii. Mavuru, L., Pila, O. K., & Kuhudzai, A. G. (2021). Preservice teachers' levels of adaptations to remote teaching and learning at a University in a developing country in the context of COVID-19. *International Journal of Higher Education*, 11(1), 12. <https://doi.org/10.5430/ijhe.v11n1p12>
- xxxviii. McGarr, O., & McDonagh, A. (2020). Exploring the digital competence of preservice teachers on entry onto an initial teacher education programme in Ireland. *Irish Educational Studies*, 40(1), 115-128. <https://doi.org/10.1080/03323315.2020.1800501>
- xxxix. Mercader, C., & Gairin, J. (2021). The perception of teachers' digital competence of Preservice pre-primary and primary education teachers. The influence of degree and entrance path. *IEEE Revista Iberoamericana de Tecnologías del Aprendizaje*, 16(1), 100-106. <https://doi.org/10.1109/rita.2021.3052684>

-
- xl. Milutinović, V. (2020). Examining the digital competencies of preservice teachers. *Proceedings of the International Conference Professional Competences for Teaching in the 21st Century*. <https://doi.org/10.46793/pctja.19.373m>
- xli. Mohamad Nasri, N., Husnin, H., Mahmud, S. N., & Halim, L. (2020). Mitigating the COVID-19 pandemic: A snapshot from Malaysia into the coping strategies for preservice teachers' education. *Journal of Education for Teaching*, 46(4), 546-553. <https://doi.org/10.1080/02607476.2020.1802582>
- xlii. Moorhouse, B. L. (2020). Adaptations to a face-to-face initial teacher education course 'forced' online due to the COVID-19 pandemic. *Journal of Education for Teaching*, 46(4), 609-611. <https://doi.org/10.1080/02607476.2020.1755205>
- xliii. Muhtadi, D., Sukirwan, S., Warsito, W., & Prahmana, R. C. (2017). Sundanese ethnomathematics: Mathematical activities in estimating, measuring, and making patterns. *Journal on Mathematics Education*, 8(2). <https://doi.org/10.22342/jme.8.2.4055.185-198>
- xliv. Muruganantham, G. (2015). Developing of e-content package by using ADDIE model. *International Journal of Applied Research*, 1(3), 52-54.
- xlv. Napal, M., Peñalva, A., & Mendióroz, A. M. (2018). Development of the digital competence in secondary education Teachers' Training. <https://doi.org/10.20944/preprints201806.0285.v1>
- xlvi. Prachagool, V., Nuangchalerm, P., & Yawongsa, P. (2022). Digital literacy of preservice teachers in the period time of COVID-19 pandemic. *Journal of Educational Issues*, 8(2), 347. <https://doi.org/10.5296/jei.v8i2.20135>
- xlvii. Porlán, I. G., & Sánchez, J. S. (2016). Evaluation and development of digital competence in future primary school teachers at the University of Murcia. *Journal of New Approaches in Educational Research (NAER Journal)*, 5(1), 51–56. <http://doi.org/10.7821/naer.2016.1.152>.
- xlviii. Ramaiah, C., Rao, M. (2021). Media and information literacy: A bibliography. *DESIDOC Journal of Library & Information Technology*, 41(04)
- xlix. Ramirez, I. (2019). Teaching senior high school: Through the eyes of student intern. *International Journal of Multidisciplinary Approach and Studies* 6.3 (2019): 42-52.
- l. Rana, K. (2020). ICT integration in teaching and learning activities in higher education: A case study of Nepal's teacher education. *Malaysian Online Journal of Educational Technology*, 8(1), 36-47. <https://doi.org/10.17220/mojet.2020.01.003>
- li. Reisoğlu, İ. (2021). How does digital competence training affect teachers' professional development and activities? *Technology, Knowledge and Learning*, 27(3), 721-748. <https://doi.org/10.1007/s10758-021-09501-w>
- lii. Reisoğlu, İ., & Çebi, A. (2020). How can the digital competences of pre-service teachers be developed? Examining a case study through the lens of DigComp and DigCompEdu. *Computers & Education*, 156, 103940. <https://doi.org/10.1016/j.compedu.2020.103940>
- liii. Resplandor, R. M. A. (2021). Effectiveness of differentiated instruction in teaching media and information literacy to senior high school students of Ungos national high school. *Sino-US English Teaching*, 18(7). <https://doi.org/10.17265/1539-8072/2021.07.002>
- liv. Richey, R.C. *Developmental Research: The Definition and Scope*. (1994).
-

-
- iv. Røkenes, F. M., & Krumsvik, R. J. (2016). Prepared to teach ESL with ICT? A study of digital competence in Norwegian teacher education. *Computers & Education*, 97, 1–20. <https://doi.org/10.1016/j.compedu.2016.02.014>.
- lvi. Sathyan, A., Funk, C., Sam, A., Radhakrishnan, A., Ragavan, S. O., Kandathil, J. V., & Vishnu, S. (2022). Digital competence of higher education learners in the context of COVID-19 triggered online learning. *Social Sciences & Humanities Open*, 100320.
- lvii. Smith, J. (2018). Media and information literacy: A 21st century approach to wellness. *EDULEARN Proceedings*. <https://doi.org/10.21125/edulearn.2018.0807>
- lviii. Stockless, A., Villeneuve, S., Bisailon, J., Fournier, F., & Venant, F. (2022). Preservice teachers' competence and pedagogical use of ICT: Are they ready to develop collaborative activities with students? *Computers in the Schools*, 39(3), 203-229. <https://doi.org/10.1080/07380569.2022.2071223>
- lix. Teo, T., & van Schaik, P. (2012). Understanding the intention to use technology by Preservice teachers: An empirical test of competing theoretical models. *International Journal of Human-Computer Interaction*, 28(3), 178-188. <https://doi.org/10.1080/10447318.2011.581892>
- lx. Thai, H. L., Kim, T. D., Phuong, L. V., & Phuong, V. N. (2022). ICT competence of preservice teachers in Vietnam: Structure and impact model. *Journal of Educational and Social Research*, 12(3), 172. <https://doi.org/10.36941/jesr-2022-0076>
- lxi. Treceñe, J. K. (2022). COVID-19 and remote learning in the Philippine basic education system. *Socioeconomic Inclusion During an Era of Online Education*, 92-110. <https://doi.org/10.4018/978-1-6684-4364-4.ch005>
- lxii. Van de Werfhorst, H. G., Kessenich, E., & Geven, S. (2022). The digital divide in online education: Inequality in digital readiness of students and schools. *Computers and Education Open*, 3, 100100. <https://doi.org/10.1016/j.caeo.2022.100100>
- lxiii. Villamayor, M. (2016). Development and validation of experiential learning mathematics package for preservice teachers. [Unpublished doctoral dissertation]. Bukidnon State University.
- lxiv. Yelubay, Y., Dzhussubaliyeva, D., Moldagali, B., Suleimenova, A., & Akimbekova, S. (2022). Developing future teachers' digital competence via massive open online courses (MOOCs). *Journal of Social Studies Education Research*, 13(2), 170-195.
- lxv. Zhao, Y., Pinto Llorente, A. M., & Sánchez Gómez, M. C. (2021). Digital competence in higher education research: A systematic literature review. *Computers & Education*, 168, 104212. <https://doi.org/10.1016/j.compedu.2021.104212>