

Improving School Heads' Digital Skills through e-Books on Canvas as a Learning Management System

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Abstract

Digital skills have been in demand in the workplace. However, school heads have demonstrated inadequacies in using digital skills in education. The study employed pre-tests and post-tests using a validated research instrument to describe the school heads' digital skills before and after the intervention. The results showed a significant improvement from the intermediate to the advanced level after using e-books on Canvas as the learning management system for upskilling their skills. Statistical analysis of the data also showed that the use of e-books resulted in an improvement in the digital skills of school heads. The paired samples t-test resulted in a calculated t-statistic of 3.781 with a corresponding p-value of 0.003, which falls below the conventional alpha level of 0.05, leading to the rejection of the null hypothesis that there is no difference in the mean score. Based on these findings, the study concludes that using e-books contributed to an increase in the level of digital skills of secondary school heads. In addition, this indicates that using e-books via Canvas as a learning management system has been proven effective because there was an increase in the mean scores, resulting in a significant improvement in the digital skills of school heads. Hence, this study calls for school heads to constantly strengthen the use of e-books and upgrade their digital skills at work using the e-books developed in this study.

Keywords: *canvas, digital leadership, digital skills, e-book, school heads, learning management system*

1. Introduction

The digitalisation process has gradually transformed the educational landscape of the Philippines. During the pandemic, educational institutions from elementary to university levels used a variety of technological teaching and learning approaches to ensure the continuous progress of students' education and employees' employment. The field of basic education specifically implemented the Learning Continuity Plan (LCP) (Department of Education, 2020). In the same way, higher education institutions have the academic freedom to choose the best way to teach and learn to keep tertiary education going (Commission on Higher Education, 2020). This includes e-learning, distance learning, and other alternative ways of teaching. In the age of digital learning, accelerated by the COVID-19 pandemic, the country is beginning to digitalise its education with the launch of numerous initiatives such as Department of Education (DepEd) Commons, DepEd TV, DepEd Radio, DepEd Learning Management System, and DepEd Mobile App, among others (Hernando-Malipot, 2023). While the pandemic is no longer a threat, school heads must be ready and equipped with the necessary digital and crisis leadership skills to lead their schools, especially in difficult times.

With the development of technology, most learning resources are also shifting from physical copies to e-books, also called electronic books or digital books; they replace the function of printed books and are practically electronic versions of books that can be downloaded and used easily anytime and anywhere. In contrast to printed books, e-books present digital information in text, images, animations, and videos that are more easily accessible, which can significantly contribute to the learning process, especially in online learning. Previous studies have shown that e-books can improve 21st-century critical thinking, creativity, collaboration, and communication skills, supporting the notion that e-books need to be developed in schools so that distance learning can proceed well. A successful implementation provides many advantages for students and teachers - making the learning process run effectively and communicatively. Thus, this research provides innovations from previous research focusing on developing and utilising e-books to improve school heads' digital skills in the 21st century, which, in the end, concludes the effectiveness of e-books on the level of digital skills, particularly on school heads.

2. Literature Review

2.1. Digital Leadership of School Heads

Globally, most governments worldwide prioritise digital skills as part of their digital agendas, whereby the foundations for digital skills are laid at school. Moreover, data from PISA 2018 – mainly from Organisation for Economic Co-operation and Development (OECD) countries – showed an increase of 28 percentage points compared to 2003 (Organisation for Economic Co-operation and Development, 2021), highlighting the increased pressure for digital literacy. However, implementing this educational shift presents new challenges in adapting to digital technologies. For example, when modular distance learning as one of the modalities was implemented during the COVID-19 pandemic, teachers found the need for upskilling in instructional design, interactive technology, curriculum development, learning assessment, and mentoring to effectively utilise the system (Reantas & Digo, 2022). However, the burden of digitalisation was not only to be carried by the teachers or students. The Department of Education has established recommendations about the immediate removal of administrative tasks of public-school teachers (Department of Education, 2024) to maintain teaching and learning proficiency. Thus, school administrators and leaders must carry out these duties, particularly those that include integrating digital tools and technologies.

In the basic education department, school leaders are the school heads, usually principals, teachers-in-charge, and head teachers. The mission of leaders is to guide individuals in the right direction. This way, teachers and students can adequately meet their educational objectives, respond better to challenges, and overcome obstacles more easily (Antonopoulou et al., 2021). Considering the nation's push for digitalisation in schools, these leaders must now lead the way in creating a digital culture within educational institutions to effectively harness digital resources' potential. Subsequently, they need the necessary knowledge and skills to respond to rapid technological changes and keep up with their responsibilities. According to Antonopoulou et al. (2021), the skills include a blend of digital and soft skills, primarily effective communication in a new digital environment, fostering coherence among distant geographical locations, taking initiative, and adaptability in handling complex issues and managing urgent procedures. They must also adhere to digital leadership standards to evaluate exemplary practices and cultivate the necessary skills to leverage digital transformation inside their institutions.

Therefore, the term digital leadership emerged, whereby a digital leader is characterised as an individual who possesses inventive concepts in the realm of digital technology, inspires and encourages their subordinates within a digital setting, adeptly fosters ongoing contact with their team members in a digital context, and formulates effective digital strategies (Sagbas & Erdogan, 2022). However, these ideals expected from the leaders are far from the current reality. Tanucan et al. (2022) and Tomaro (2018) revealed that Filipino school heads have a satisfactory-only level of digital leadership. Additionally, The Global Leadership Forecast 2018 (Development Dimensions International, 2018) reported that only 23 per cent of leaders in the Philippines consider themselves influential in the digital age. Similarly, Padolina-Alcantara (2023) reported that while school administrators demonstrated a high level of skill in carrying out leadership responsibilities, they still need to prepare for the digital era of Education 4.0 in the context

of digital leadership and digital abilities. This statistic indirectly indicated the need for more purposeful emphasis on efforts to enhance the skills and abilities of school leaders in digital leadership.

According to a report by the World Economic Forum (2019), poor leadership could be the biggest barrier to a successful Fourth Industrial Revolution strategy. As a result, school leaders are now painstakingly adapting to the demands of the Industrial Revolution 4.0 to improve the present education system and further boost the technological proficiency of their teachers (Samosa et al., 2023). Achieving this goal requires explicit rules, standards, or benchmarks to assist school administrators in effectively incorporating ICT into their administrative and management duties in alignment with recognised standards such as the ISTE criteria for education leaders. Digital resources are also necessary, which include leaders with well-developed digital leadership abilities (Pendry & Salvatore, 2015). Conversely, the Philippines' insufficient digital infrastructure, obsolete technology, and sluggish internet connectivity (World Bank, 2020) were major contributors to the shortage of technical personnel responsible for computer and network maintenance and support for internet-related tasks (UNESCO Institute for Statistics, 2014). Other challenges involve preparation, competencies, funding, and compatible devices.

In response, the enactment of Republic Act 11927, also known as the "Philippine Digital Workforce Competitiveness Act," recognised the rapid changes in the labour market due to digitalisation and technological advancements such as artificial intelligence and automation across various industries and sectors. This legislation aims to enhance the proficiency and competitiveness of the labour force in the Philippines, encompassing both human capabilities and digital technology and innovations. Hence, DepEd has provided a substantial number of laptops, desktops, and other electronic technology to all schools over the past few years. As a result, school heads have their own ICT equipment to use at work. However, school heads are generally unprepared to support the ever-changing technology-rich environment. Individuals lacking familiarity with the fundamental functions of these devices cannot fully utilise the technological perks within their leadership. While most school heads are already familiar with the essential functions of this ICT equipment, only a small percentage can utilise the devices to their optimal potential, particularly in completing reports and other documents (Antio & Dioso, 2023).

Ismail et al. (2021) concluded that principals still need to implement improvements to fully master the character of technology leaders. Three additional dimensions, visionary leadership, digital-age learning culture, and systemic improvement, underpin the situation and require periodic improvement.

2.2. Digital Skills of School Heads

Digital skills are key to a successful information society, and in this fast-changing digital era, school leaders are associated with using them. The ubiquitous nature of digital environments necessitates that individuals possess fundamental skills to use them safely, healthily, effectively, and appropriately. "Digital skills" refers to the ability to find, evaluate, use, share, and create content using digital devices such as computers and mobile phones (Montoya, 2018; World Bank, 2016). Initially, there were four types of digital skills. According to van Deursen and van Dijk (2008), the four types of digital skills can be refined into these three main skills: operational skills (the skills to operate the digital media), formal skills (the skills to handle the structures of digital media), and information skills (the skills to employ the information contained in digital media towards personal and professional development). Meanwhile, Van Niekerk and Van Wyk (2014) described digital skills as partly focusing on integrating digital technologies into the educational system. Likewise, Tanucan et al. (2022), and Makhdalena et al. (2021) mentioned the qualities of school leaders as digital leaders.

Dagli et al. (2023) claimed that school administrators play an important role in developing their digital skills and successfully managing digital transformation. They asserted that if school administrators possess deficiencies compared to teachers, they must enhance these areas to benefit the school and students during the digital transformation process. Similarly, the technological skills of school heads are vital to meeting the quality requirement of becoming digital leaders (Maala & Lagos, 2023). Antonopoulou et al. (2021) justified that school heads as digital leaders can positively influence the performance of teachers and students if they are equipped with the appropriate digital skills, which will be more effective. Similarly, school heads' digital leadership also influences teachers, job satisfaction, and overall competence

(Tanucan et al., 2022; Thanninalai & Raman, 2018). Therefore, this study specifically targeted the enhancement of the digital proficiency of school administrators; a skill set currently not given sufficient attention in the Philippine Professional Standards for School Heads (PPSSH).

Achieving this leadership level means overcoming the lack of ideas with the use of equipment, insufficient modern ICT facilities, poor internet networks, poor maintenance culture, and budgetary constraints of ICT personnel (Antio & Dioso, 2023; Samosa et al., 2023). Additionally, Grissom and Harrington (2010) and Richardson et al. (2012) recommended professional development training programmes for principals, up-to-date courses for administrators, and ICT curriculum standards for K-12 schools in the Philippines to promote the heads in being technology-know-how leaders and agents of digital technology in the school. Providing these necessities while motivating them to embrace changes is essential in their work leading towards ICT integration. Likewise, developing programmed learning or module learning lessons that promote high levels of thinking skills in the 21st century and educational leadership at the higher education institution level with bachelor's, master's, and doctoral students is also recommended (Luecha et al., 2022).

Relatively, the researchers developed and implemented online professional development training using e-books to help school heads strengthen and upgrade their use of digital skills, which may eventually lead to digital leadership transformation.

2.3. E-books via Canvas as a Learning Management System

It is undeniable that technology also affects changes in the use of books. E-books are an innovation influenced by the emergence of existing technology (Guevara, 2021; Guo, 2021). An e-book is an abbreviation of 'electronic book'. They are a practical form of printed books and can be used as a learning tool (Farigan, et al., 2024) and can be accessed with electronic devices and the internet. In the digital era, e-books are one of the non-printed teaching materials is an e-book, differing from physical books by being more interactive and communicative and containing not only text or images but also animation, video, or audio. According to Yulaika et al. (2020), e-books used as teaching materials must contain competencies, indicators, learning objectives, materials, practice questions, and references. As such, e-books were created and used to enhance the digital skill deficiencies among school heads and provide them with the necessary information and abilities for the digital era.

The researchers are interested in improving digital skills for school heads using e-books for remote areas or "marginalised schools". These schools include local secondary schools in remote areas, such as coastal barangays, particularly in the Province of Sorsogon, Philippines. The geographic location of these schools poses obstacles to education, as they lack basic facilities like computers and desktops and have limited internet services compared to their city counterparts. It is expected that the research result will be beneficial to relevant agencies in marginalised school administration at all levels in the future. In today's fast-changing digital-based leadership, school heads must be fully prepared to use digital skills to meet the mandate and goals of the fourth industrial revolution in education. While there are many studies on digital technologies in education, research on improving digital skills and their uses for secondary school heads in developing countries such as the Philippines remains limited. Therefore, the researchers face the challenge of transforming, enhancing, and cultivating the digital skills of school heads.

Hence, this study aimed to improve the digital skills of school heads in the secondary schools of DepEd Division of Sorsogon Province through e-books on Canvas as a learning management system for the school year 2023-2024. Specifically, it sought to answer the following questions: (1) What intervention may be developed and implemented based on the needs of the school heads to improve their digital skills? What was the level of digital skills of the school heads before and after the intervention? (3) How effective is the use of e-books on Canvas as LMS in improving the digital skills of school heads? To improve school heads' digital skills and navigate their leadership journey in the digital age, this study utilised e-books that contained digital information, headlines or objectives of specific school heads' digital skills, and illustrations with pictures, video links, and text on the pages.

3. Research Method

3.1. Research Design

This study employed the action research methodology. The action research method is most suitable for this study because its primary objective is to address the immediate learning gaps in enhancing digital skills among school leaders. Fraenkel and Wallen (2010) defined action research as a pragmatic research methodology aimed at resolving specific problems and enhancing practitioners' methods by employing existing resources. Practitioners frequently employ this research methodology to address their immediate environment's difficulties, concerns, and challenges (Fajardo & Digo, 2023; Digo & Labor, 2022; Digo, 2021). It focuses on implementing suitable interventions, innovations, or changes in practice within a short period.

3.2. Participants

This study involved 13 school head participants in the Division of Sorsogon Province for the school year 2023-2024. At the time of the study, three participants were principals, one was an assistant principal, and nine were head teachers. Among the participants, there are two male and one female principal, one female assistant principal, and three male and six female head teachers. This study employed purposeful sampling, a method that selects participants and research sites based on specific criteria suiting the study's objectives (Samosa et al., 2023). The criteria set in this study for being a participant were being the informants of the needs assessment, having at least three years of experience as a school administrator, and having the capacity and willingness to participate in the conduct of action research interventions. Before the implementation phase, the researchers obtained informed consent from the participants.

3.3. Research Instrument

In this study, we modified a survey questionnaire from Padolina-Alcantara (2023) to assess twenty-five digital skills indicators for school heads. The researchers emailed the original developer to obtain permission to adapt their research questionnaire to assess the school heads' level of digital competence. These indicators were regrouped into five categories and tested using Cronbach alpha, with a result of 0.97 which demonstrated its reliability. Whereas to determine its validity, a team of experts examined the questionnaire before its final use in the research study: the Chief of School Governance and Operations Division (SGOD); Education Program Supervisor on Special Programs and Projects (SPP); Division Math Supervisor; Division English Supervisor; and Division Information Technology Officer.

A questionnaire checklist on the level of school heads' digital skills was used in the pre-and post-tests, covering the twenty-five digital skills. The researchers also developed five items for each digital skill in the pre-and post-tests, resulting in 150 test questions. As a result of the pilot testing, test materials have 0.914 reliability using Cronbach's alpha, with the alpha based on standardised items being 0.918 for a scale with 46 items. This result indicates a very high level of internal consistency among the items on the scale. Thus, the survey or test scale exhibits excellent reliability, and the included items consistently measure the underlying construct. The researchers reduced the 46 items into a coherent set of 25 test items, ensuring an equal distribution of digital skills.

3.4. Data Collection Procedures

The researchers administered the questionnaire via an online survey platform, Google Forms by sharing the link with the participants twice: once before the intervention (pre-test) and once after the intervention implementation (post-test). Based on the first self-assessment results, the researchers determined potential interventions, considering the resources at hand, technological capacities, and busy schedules of school administrators, as well as the brochure's content, and anticipated digital skills of school administrators.

The researchers shared the brochure content, hands-on activities, and the survey link on Canvas as interventions and executed the interventions over six weeks using the Canvas application platform. The

researchers observed and addressed inquiries from the participants through online channels. The participants were provided with instructions for the activities. These participants responded to the activities, demonstrating their engagement with the interventions. The participants transmitted their responses to the activities through Google Forms, Canvas, or a private message to prevent any unauthorised disclosure. Finally, the researchers conducted a post-test after six weeks to evaluate the learning outcomes and identify any major disparities between the pre-test and post-test scores.

3.5. Data Analysis

The researchers used the following scale, range, and descriptions to interpret the school heads' digital skill levels: the first category, 1.00–1.49 (beginner), signifies the respondents' limited knowledge of these skills; the score of 1.50–2.49 (intermediate) indicates that the respondents have a moderate level of understanding and occasionally apply the skill; the third category, 2.50–3.49 (advanced), indicates that the respondents have a high degree of knowledge and frequently utilise their talent in their work; and finally, 3.5–4.00 (expert) signifies that the respondents have an extensive understanding of the skill and use it daily. Moreover, the researchers conducted a t-test at the 5% significance level to compare and analyse the pre-test and post-test results of the participants, aiming to assess the effectiveness of e-books in improving the digital skills of school heads.

4. Findings and Discussion

4.1. Utilisation of e-books in Canvas LMS as an Intervention to Improve the School Heads' Digital Skills

During the online training program, e-books were developed as materials for online distance training intended for school heads, and such e-books can be accessed with the help of Canvas as a Learning Management System. One of the advantages of an LMS is the possibility of keeping all the resources and files available as often as necessary (Queiruga-Dios et al., 2015). The Canvas LMS is a free and open avenue where the learners and facilitator can interact with each other, and even download and upload or submit e-books or outputs can be done with it. Additionally, this platform offered a learning opportunity to practice and review school heads' digital skills. It could help them navigate and explore the online world by integrating e-books as their instructional aids.

The development of these e-books considered their initial level of digital skills to help them enhance their digital skills. Expert evaluators reviewed and validated the e-books before utilising them to ensure their effectiveness, efficiency, appeal, and general satisfaction. The e-book had been written and designed to communicate ideas to school heads; it served as a visual guide to improve their digital skills. It includes headlines about specific digital skills, illustrations with pictures, and text on the page. Its designs are attractive, interesting, and easy to comprehend, with concise content and interactive language. It also contains big and more readable fonts, relevant illustrations and a page with a simplified explanation of technical terms.

According to a related study by Simui et al. (2017), the use of user-friendly instructional materials, from the learners' perspective, is anchored on the general layout and presentation, the use of clear and concise language, the font size and module, the coherence of ideas, the use of illustrations, and the explanation of technical terms, which are some of the emerging themes reflected. This e-book contains two sequential learning activities and a “Consider this” section as the final check-out activity. A brief overview precedes each hands-on learning activity and the final check-out activity. These activities provide digital learning experiences to help them accomplish the desired outcomes or objectives, the twenty-five digital skills. Specifically, this study aimed to provide interventions enabling participants to use digital technologies and tools more efficiently and conveniently, thereby developing their digital skills.

As cited in Tajudin et al. (2017), Waltz recommended an acceptable standard for the index of average congruity using the CVI method, which is 0.90 for five evaluators. The instrument could be considered evidence of good validity. According to the evaluators, the e-book is primarily used for review, concepts and practice, clarification, reinforcement, and reflection. The e-books' contents are aligned with the 25 indicators of digital skills. They contain six categories with not more than five pages bound together to achieve a mini-booklet-like learning brochure that is handy to carry and convenient for the readers. The six categories are Topic 1: Digital Access; Topic 2: Digital Collaboration Tools; Topic 3: Digital Media and the Web; Topic 4: Online Platform Tools; Topic 5: Digital Security and Privacy; and Topic 6: Digital Commerce.

To effectively study and learn the message and easily grasp the content of the e-book, 25 indicators for digital skills were grouped according to types of digital skills such as operational, formal, information, and strategic digital skills. As the name describes, operation skills are skills to operate digital media; formal skills are skills to handle structures of digital media; information skills are skills to locate information in digital media; and strategic skills are skills to employ the information contained in digital media towards personal (and professional) development. The objective of using e-books on Canvas LMS is to assist school heads with developing and using digital skills through practising and reviewing school heads' digital skills, which can enhance knowledge and skills.

4.2. Digital Skills of School Heads Before and After Intervention

The pre-test resulted in overall school heads scoring poorly and not considering themselves experts in any digital skill indicator. According to the results presented in **Table 1**, 24 out of 25, or 96% of the indicators, were rated at the intermediate level, while only 1 or 4% of the school heads were at the beginning level. It can be concluded that most school heads are only at the beginning level when publishing materials online. The results implied that the school heads are not used to publishing their works online.

Particularly, before the intervention was conducted, Indicator 2e in **Table 1** got the highest mean rating of 2.38 (Intermediate Level). This shows that school heads are proficient in using online data systems when it comes to doing their work at school. This can be attributed to the fact that since they are administrators of online data systems, they were most exposed to such systems like Enhanced Basic Education Information System (EBEIS), Learning Information System (LIS), Enterprise Human Resources Information System (EHRIS), Learning Resources Management and Development System (LRMDS), and Department Partnerships Database System (DPDS), but their skills still needed to be enhanced to achieve high mastery of skills.

However, Indicator 2a got the lowest, with a mean rating of 1.38 (Beginning Level). The school heads are not required to publish materials online, such as research work, strategic instructional materials (SIMs), or learning materials on any publishing site. Teachers or master teachers usually do these. This result conveys that the school heads needed necessary adjustments to intensify their knowledge, especially in publishing materials in any publishing tools for dissemination. This finding coincides with the study of Padolina-Alcantara (2023), who found that among the 25 listed digital skills, publishing materials on the web using any publishing tools ranked last, with a mean of 3.12, falling under developing readiness.

However, after the intervention, 24 out of 25, or 96% of the indicators, were rated advanced, while only one out of 25, or 4%, was rated at the intermediate level. This proves that the use of digital skills of school heads improved after the use of e-books. Specifically, Indicators 4a and 1e got the highest mean rating of 3.31 (Advanced Level). This signifies that the use of e-mail and digital collaboration tools, in general, reached the advanced level, but there are areas that the school heads still need to master to fully utilise and enjoy the advantages that the programme offers. This implies that the school heads display mastery in the manipulation of e-mail and different collaboration tools online. Among all indicators, only Indicator 2a got the lowest with a mean of 2.15 (Intermediate Level). The results further imply that school heads improved a lot in terms of publishing materials online after the use of e-books via Canvas as an LMS.

Table 1. Level of Digital Skills of School Heads

Indicators	Before		After	
	Weighted Mean	Verbal Interpretation	Weighted Mean	Verbal Interpretation
Category 1. Operational Digital Skills				
a. Download and save data (images, files, software, etc.).	2.15	I	3.23	A
b. Edit documents using collaboration software.	1.77	I	2.62	A
c. Download and install the software on a computer.	2.08	I	3.00	A
d. Download and upload curriculum resources from/to websites or learning platforms for students' use.	2.00	I	3.15	A
e. Use digital collaboration tools (Google Docs, Google Slides, Google Sheets, Google Forms, etc.).	1.69	I	3.31	A
f. Know how to store or retrieve data and information using online storage.	2.08	I	3.00	A
Category 2. Formal Digital Skills				
a. Publish materials on the web using any publishing tools.	1.38	B	2.15	I
b. Purchase materials online.	2.23	I	2.85	A
c. Enhance the level of security settings to protect personal information online.	1.85	I	2.77	A
d. Use appropriate tools and utilities to protect personal information online.	1.69	I	2.54	A
e. Use different online data systems (EBEIS, LIS, EHRIS, LRMDs, DPDS).	2.38	I	3.08	A
f. Make and use digital presentations.	1.92	I	2.92	A
g. Use software productivity tools effectively.	1.77	I	2.61	A
Category 3. Information Digital Skills				
a. Evaluate and choose a suitable connection method to access the internet.	2.15	I	3.23	A
b. Evaluate, choose, and use appropriate search engines.	2.23	I	3.23	A
c. Evaluate online information for relevance, bias, validity, reliability, and sufficiency.	1.77	I	3.00	A
d. Recognise ownership of digital information and guard against digital theft and plagiarism.	2.00	I	2.85	A
e. Use the internet to efficiently find credible information and resources.	2.31	I	3.15	A
f. Evaluate quality digital instructional curricula.	2.00	I	2.85	A
Category 4. Strategic Digital Skills				
a. Use an e-mail account for exchanging information with colleagues, teachers, learners, parents, and stakeholders.	2.31	I	3.31	A
b. Participate in a discussion forum on the internet.	2.08	I	3.00	A
c. Participate in social networking.	1.92	I	2.85	A
d. Can take or attend online courses	2.08	I	3.08	A
e. Facilitate online discussion, orientation, or training development activities.	1.69	I	2.77	A
f. Use online communication platforms.	2.00	I	3.08	A
Overall Mean	1.98	I	2.96	A

Table 2 presents the summary of the level of secondary school heads' digital skills before and after the conduct of the intervention. In terms of digital skills, generally, the secondary school heads were at an intermediate level with a weighted mean of 1.98 before the intervention while they were at the advanced level with a weighted mean of 2.96 after the intervention. This indicates that school heads are now proficiently knowledgeable with digital skills and often use such skills at work after the conduct of the interventions.

Table 2. Summary of Levels of Digital Skills of School Heads Before and After the Intervention

Types of Digital Skills	Before		After	
	Weighted Mean	Description	Weighted Mean	Description
a. Operational Digital Skills	1.96	I	3.05	A
b. Formal Digital Skills	1.89	I	2.70	A
c. Information Digital Skills	2.07	I	3.05	A
d. Strategic Digital Skills	2.01	I	3.02	A
Average	1.98	I	2.96	A

The level of digital skills of school heads showed the highest rank in the category of Information Digital Skills with a mean of 2.07 (Intermediate Level) before the conduct of the intervention. Similarly, Operational Skills (1.96), Formal Skills (1.89), and Strategic Skills (2.01) were also at the Intermediate level. Meanwhile, the category with the highest rank after the conduct of the intervention is Operational Digital Skills and Information Digital Skills with a mean rating of 3.05 (Advanced Level), followed by Strategic Digital Skills with a mean rating of 3.02 (Advanced), followed by Formal Digital Skills with the mean rating of 2.70 (Advanced). The results mean that the school heads' digital skills improved after using the e-books.

One of the school head participants also supported the results, who commented, *“They assisted me in revisiting the guidelines and manuals for using various social platforms because those e-books contain useful information since I don't frequently use some of them. The e-books serve as helpful references whenever I use the app. It can enhance my learning experiences using digital tools, and I can keep it for when I need these e-books.”* This may also mean that the school heads satisfactorily complied and performed the tasks that involved digital tools and instructional e-books to develop digital skills. Thus, providing school heads with online training with learning material was proven to be highly effective for school heads in becoming digital leaders and performing internet-related tasks at work with ease.

These findings strongly suggest that school heads may enhance their digital leadership and management skills by incorporating digital technologies. This effort will not only improve but revolutionise the delivery of their educational leadership content. This initiative is consistent with the findings of Agravante et al. (2023), which revealed that upskilling significantly enhanced the leadership competencies of school heads.

4.3. Effectiveness of the e-books on Canvas as an LMS

Reflected in **Table 3** below is the analysis of the assessment of the pre-test and post-test results by the participants to determine the effectiveness of the used e-books.

Table 3. Difference between the Pre-test and Post-test Scores

		Paired Differences				t	df	Sig.(2-tailed)	
		Mean	Std. Deviation	Std Error Mean	95 % Confidence Interval of the Difference				
					Lower				Upper
Pair 1	Pre-test Scores Post-test Scores	-2.23077	2.12736	0.59002	-3.51632	-0.94522	3.781	12	0.05

Figure 1 illustrates the average pre-test and post-test scores. The gain-test calculation results indicate that the post-test gain-score average exceeds the pre-test average score. This overall result falls into the effective category.

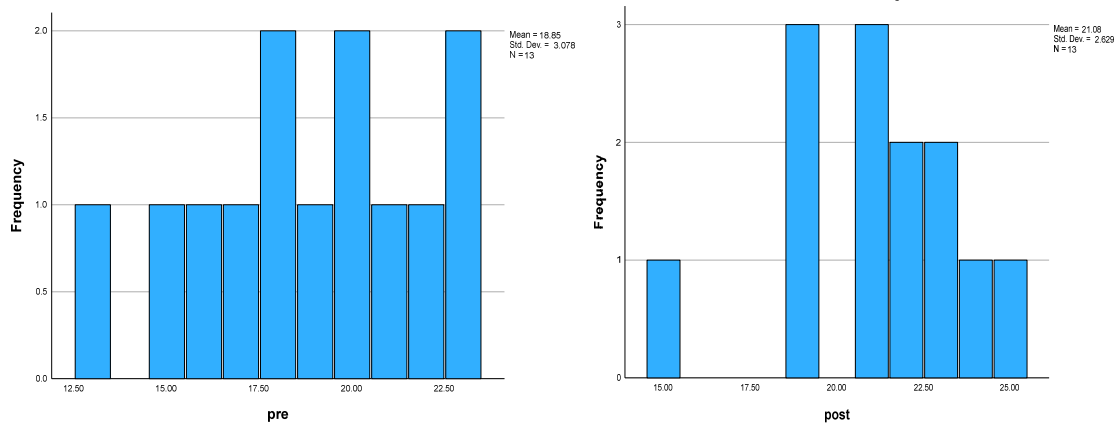


Figure 1. Mean of Score for Pre-test and Post-test

The data was then subjected to a paired-sample t-test to determine whether there was a significant difference between one-group means. To recap, 13 participants were assessed in this study before and after a specific intervention to determine its effectiveness. The initial mean score was recorded at 18.85, followed by a mean score of 21.08 after the intervention, deducing a positive change. To ensure the reliability of further statistical tests, the normality of the data was verified using the Kolmogorov-Smirnov and Shapiro-Wilk tests, both of which confirmed that the differences between pre and post-test scores were normally distributed.

The core of the statistical analysis was a paired samples t-test, which yielded a mean difference of -2.23077 between the pre-intervention and post-intervention measurements. The negative value represents a statistically significant decrease, as substantiated by a 95% confidence interval that ranged from -3.51632 to -0.94522, excluding the possibility of no change (zero difference). The calculated t-statistic was -3.781, with a corresponding p-value of 0.003, which falls well below the conventional alpha level of 0.05, leading to the rejection of the null hypothesis that there would be no difference in the means. The study results are thus significant and suggest that the intervention had a notable effect on the measured variable, reflected in a measurable decrease from the pre- to the post-intervention stage.

This finding is critical for understanding the intervention's impact. It implies that if the same conditions are applied to a broader population from which the sample was derived, similar outcomes can be expected. Meanwhile, several studies were in agreement with the findings. Rahim et al. (2020) revealed in their systematic literature review that the use of e-books in the learning process has a positive impact on the level of effectiveness. From the 12 journals that have been analysed, 5 journals give a value of the percentage of effectiveness between 80% to 85%, 6 journals give a score of 85% to 90%, and 1 journal gives a score of more than 95%. A similar study revealed that e-books are still widely used to support learners to obtain even better learning outcomes (Suriani et al., 2023).

During the study, a school head participant noted, *“The e-book is user-friendly. It gently guides me to improve my digital skills. It is favourable on my part, who is not computer savvy, because I can read and re-read it as many times as I can until I fully understand and follow the instructions, particularly for the hands-on activities”*. This feedback further supported Simui et al. (2017), who reported that the use of user-friendly instructional materials based on the learners' perspective is anchored on the general layout and presentations, the use of clear and concise language, the size of font and module, the coherence of ideas, the use of illustrations, and the explanation of technical terms which are some of emerging themes.

5. Conclusions and Recommendations

Based on the findings, this study revealed that integrating e-books into continuous professional development programmes significantly enhances the digital skills of school heads. Likewise, after using the e-books, school heads' digital skills significantly improved from intermediate to advanced levels. The increase in mean scores from 18.85 to 21.08, which shows statistical significance with a p-value of less than 0.05, indicates an inclusive improvement in secondary school heads' performance before and after the intervention. These results showed that the e-books on Canvas effectively improved the school heads' digital skills. Therefore, the researchers recommend a hands-on face-to-face or hybrid demonstration seminar for digital skills retooling and upskilling with the integration of e-books to improve the digital skill levels of school heads essentially. Finally, this paper contributes to school digital leadership and digitalisation, striving to implement and advance digitalisation in schools. This research also highlights the prioritisation of digitalisation as one of many important areas in schools as institutions.

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References

- Agravante, M. B., Digo, G. S., & Janer, S. S. (2023). Upskilling of the school heads in the new normal. *East Asian Journal of Multidisciplinary Research*, 2(6), 2509–2524. <https://doi.org/10.55927/eajmr.v2i6.4257>
- Antio, J. C. & Dioso, E. D. (2023). The impact of digital literacy on school heads to their performance as school leaders. *International Journal of Multidisciplinary Research*, 9(7), 214-222. <https://doi.org/10.36713/epra2013>
- Antonopoulou, H., Halkiopoulou, C., Barlou, O., & Beligiannis, G. O. (2021). Transformational leadership and digital skills in higher education institutes during the COVID-19 pandemic. *Emerging Science Journal*, 5(1), 1-21. <http://dx.doi.org/10.28991/esj-2021-01252>
- Commission on Higher Education (CHED). (2020, March 11). *Guidelines for the prevention, control and mitigation of the spread of coronavirus disease 2019 (COVID-19) in Higher Education Institutions (HEIs): CHED COVID-19 Advisory No. 19*, Republic of the Philippines, Office of the President, Commission on Higher Education. <https://ched.gov.ph/wpcontent/uploads/CHED-COVID-19-Advisory-No.-6.pdf>
- Dagli, G., Muhtaroglu, M. B., Bastas, M., Altinay, F., & Altinay A. (2023). Evaluation of primary school managers' duties on digital transformation. *Revista GeSec São Paulo, SP, Brasil*, 14(9), 15227-15249. <http://doi.org/10.7769/gesec.v14i9.2524>
- Department of Education. (2020). *Adoption of the basic education learning continuity plan for School Year 2020-2021 in light of the COVID-19 public health emergency*. https://authdocs.deped.gov.ph/depedorder/do_s2020_012-adoption-of-the-be-lcp-sy-2020-2021/
- Department of Education. (2024). *Department of Education Order No. 002, s. 2024: Immediate removal of administrative tasks of public-school teachers*.
- Development Dimensions International. (2018). *The Global Leadership Forecast 2018*. https://media.ddiworld.com/research/global-leadership-forecast2018_ddi_tr.pdf
- Digo, G. S. (2021). Effectiveness of a university extension program on pedagogical action research. *Action Learning and Action Research Journal*, 27(2), 49-64. <https://alarj.alarassociation.org/index.php/alarj/article/view/331>
- Digo, G. S., & Labor, J. S. (2022). Effectiveness of online colloquia in improving the research dissemination skills of graduate students. *ASEAN Journal of Open and Distance Education*, 14(2), 42-53. https://ajodl.oum.edu.my/document/Previous/Volume14.N0.2_2022/05.%20Effectiveness%20of%20Online%20Colloquia%20F.pdf

- Fajardo, E. G., & Digo, G. S. (2023). Action research training: Its effect on the research attitude, knowledge and performance of teachers. *Jurnal Pendidikan Progresif*, 13(2), 329-346. <https://jurnal.fkip.unila.ac.id/index.php/jpp/article/view/26632>
- Fraenkel, J., & Wallen, N. (2010). *How to design and evaluate research in education*. McGraw-Hill Companies, Inc.
- Guevara, J. P. (2021). Promoting early literacy using digital devices: A pilot randomized controlled trial. *Academic Pediatrics*, 21(6), 1001–1008. <https://doi.org/10.1016/j.acap.2021.05.013>
- Grissom, J. A., & Harrington, J. R. (2010). Investing in administrator efficacy: an examination of professional development as a tool for enhancing principal effectiveness. *American Journal of Education*, 116(4), 583-612.
- Guo, W. (2021). Seeing the future of education: Three-year experiment of digital reading online course. In R. Li, S. K. S. Cheung, C. Iwasaki, L. F. Kwok, & M. Kageo (Eds.), *Blended learning: Re-thinking and re-defining the learning process* (pp. 41–53). *ICBL 2021. Lecture Notes in Computer Science*, 12830. Springer. https://doi.org/10.1007/978-3-030-80504-3_4
- Hernando-Malipot, M. (2023, October 2). *DepEd trains over 550K teachers for SY 2021- 2022 through VINSET 2.0*. *Manila Bulletin*. <https://mb.com.ph/2021/09/02/deped-trains-over-550k-teachers-for-sy-2021-2022-through-vinset-2-0/>
- Ismail, S. N., Omar, M. N., & Raman, A. (2021). The authority of principal's technology leadership in empowering teachers' self-efficiency towards ICT use. *International Journal of Education and Research in Education*, 10(3), 878-885. <https://doi.org/10.1159/ijere.v10i3.21816>
- Luecha, C., Chanarasombat, C., & Sirisuthi, C. (2022). Program development of digital leadership for school administrators under the office of primary educational service area. *World Journal of Education*, 12(2), 15-27. <https://doi.org/10.5430/wje.v12n2p15>
- Maala, E. B., & Lagos, F. D., (2022). Technological leadership of school heads and teachers' technological integration: basis for the development of a training program. *International Journal of Multidisciplinary: Applied Business and Education Research*, 3(1),2074-2089. <http://dx.doi.org/10.11594/ijmaber.03.10.19>
- Makhdalena, Fitria, H., & Fitria, Y. (2021). Leadership of schools in the digital era in improving professional competency. *Advances in Social Science, Education and Humanities Research*, 565, 1272-1276. <http://creativecommons.org/licenses/by-nc/4.0/>
- Mohammadi A., Mojtahedzadeh, R., Emami A. H., & Dehpour, M. (2015). Pamphlet as a tool for continuing medical education: performance assessment in a randomized controlled interventional study. *Medical Journal of the Islamic Republic of Iran*, 29(252), 1-6.
- Montoya, S. (2018). *Meet the SDG 4 data: indicator 4.4.1 on skills for a digital world*. <https://sdg.uis.unesco.org/2018/08/08/meet-the-sdg-4-data-skills-for-a-digital-world>.
- Organisation for Economic Co-operation and Development. (2021). *21st-Century Readers: Developing Literacy Skills in a Digital World*. PISA, OECD.
- Padolina-Alcantara F. P. (2023). Digital Era Readiness and Leadership and Management Competencies of School Heads in the Schools Division of Marinduque. *International Journal for Research in Applied Science & Engineering Technology*, 11(5), 2886-2903.
- Pendry, L. F., & Salvatore, J. (2015). Individual and social benefits of online discussion forums. *Computers in Human Behavior*, 50, 211–220. <https://doi.org/10.1016/j.chb.2015.03.067>
- Queiruga-Dios, A., Izard-Anaya, E., Bullón-Pérez, J. J., Hernández-Encinas, A., & Martín-Vaquero, J. (2015). Case study: Online learning for design and calculation of machines. *Frontiers in ICT* 2, 1–8. <https://doi.org/10.3389/fict.2015.00027>
- Rahim, F. R., Suherman, D. S., & Muttaqin, A. (2020). Exploring the effectiveness of e-book for students on learning material: a literature review. *Journal of Physics: Conference Series*. <https://doi.org/10.1088/1742-6596/1481/1/012105>

- Reantaso, L. M., & Digo, G. S. (2022). Teachers' roles, needs, and best practices in modular distance learning modality. *ASEAN Journal of Open and Distance Learning*, 14(1), 24-37.
https://ajodl.oum.edu.my/document/Previous/Volume14.N0.1_2022/03.%20Teachers%20Roles,%20Needs.pdf
- Richardson, J. W, Bathon, J., Flora, K. L., & Lewis, W D. (2012). NETS-A scholarship: a review of published literature. *Journal of Research on Technology in Education*, 45(2), 131-151.
- Sagbas, M., & Erdogan F. A. (2022). Digital Leadership: A systematic conceptual literature review. *Istanbul Kent University Journal of Humanities and Social Sciences*, 3(1), 17-35
- Samosa, R., Blanquisco, M. J., & De Leon, S. (2023). Towards a digital school leadership framework for school head and the teacher digital competence: input for school leader digital learning guide. *AMERICAN Journal of Science and Integration and Human Development*, 1(5), 102-154.
- Simui, F., Thompson, L.C., Mundende, K., Mwewa, G., Kakana, F., Chishiba, A., & Namangala, B. (2017). Distance learners' perspective on user-friendly instructional materials at the University of Zambia. *Journal of Learning Development*, 4(1), 90-98.
- Suriani, N. M., Agustini, K., Sudhata, I. G. W., & Dantes, G. R. (2023). The effectiveness of e-book in learning process: A systematic literature review. *International Journal of Social Sciences*, 6(2), 43-50.
<https://doi.org/10.21744/ijss.v6n2.2103>
- Tajudin, N. M., Puteh, M., & Adnan, M. (2017). Developing themes of guiding principles to foster higher-order thinking skills in teaching and learning of Mathematics. *International Journal of Academic Research in Progressive Education and Development*, 6(1), 90-103.
- Tanucan, J.C. M., Negrido, C. V., & Malaga, G. N. (2022). Digital leadership of school heads and job satisfaction of teachers in the Philippines during the Pandemic. *International Journal of Learning, Teaching and Educational Research*, 21(10), 1-18. <https://doi.org/10.26803/ijlter.21.10.1.203-227>
- Tarigan, R, J., Kembaren, B, P, B., Fionasari, R., Pambudi, N., & Hartono, R, N. (2024). Analysis of the effectiveness of e-books in increasing students' digital literacy. *Journal Emerging Technologies in Education*, 2(1), 36–48. <https://doi.org/10.70177/jete.v2i1.736>
- Thanninalai, R., & Raman, A. (2018). The influence of principals' technology leadership and leadership and professional development on teachers' technology integration in secondary schools. *Malaysian Journal of Learning and Instruction*, 15(1), 203-227.
- Tomaro, Q. P. V. (2018). ICT integration in the educational system of Philippines. *Journal of Governance and Public Policy*, 5(3), 259-282
- UNESCO Institute for Statistics (2014). *Information and communication technology (ICT) in education in Asia: A comparative analysis of ICT integration and e-readiness in schools across Asia*. <http://dx.doi.org/10.15220/978-92-9189-148-1-e>
- van Deursen, A. J. A. M., & van Dijk, J. A. G. (2008). Measuring digital skills: Performance tests of operational, formal, information and strategic internet skills among Dutch population. *ICA Conference*, 1–25.
- Van Niekerk, E. J., & Van Wyk, M. M. (2014). Staff's perceptions of vision and long-term principal leadership in South African schools: An exploratory study. *Mediterranean Journal of Social Sciences*, 5(4), 406–414.
<https://doi.org/10.5901/mjss.2014.v5n4p406>
- World Bank. (2016). *World Development report 2016: Digital dividends*. World Bank Publications.
<https://www.worldbank.org/en/publication/wdr2016>
- World Bank. (2020). *Philippines Digital Economy Report 2020: A better normal under COVID-19: Digitalizing the Philippines economy now*. <https://documents1.worldbank.org/curated/en/796871606150398190/pdf/Philippines-Digital-Economy-Report-2020-A-Better-Normal-Under-COVID-19-Digitalizing-the-Philippine-Economy-Now.pdf>

- World Economic Forum. (23 January 2019). *The 4 types of leaders who will thrive in the Fourth Industrial Revolution*.
<https://www.weforum.org/agenda/2019/01/these-fourleadership-styles-are-key-to-success-in-the-fourth-industrial-revolution/>.
- Yulaika, N. F., Harti, H., & Sakti, N. C. (2020). Pengembangan bahan ajar elektronik berbasis flip book untuk meningkatkan hasil belajar peserta didik [Development of flip book-based electronic teaching materials to improve student learning outcomes]. *Jurnal Pendidikan Ekonomi, Manajemen Dan Keuangan*, 4(1), 67–76.
<https://doi.org/10.26740/jpeka.v4n1.p67-76>