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Comparative Effectiveness of Website, Application, and Built-In Operating System Media in Digital Record Management Learning

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ABSTRACT

Integrating technology into archival learning is essential for equipping vocational students with competencies aligned with the digital era. This study investigates the comparative effectiveness of three digital media—Windows Explorer (WE), Digital File Cabinet (DFC), and ERISE—in enhancing students' knowledge and skills in archival practice. A post-test only control group experimental design was employed involving 214 students enrolled in an Archival Management course. Participants were randomly assigned to three groups: control (WE, $n = 74$), experimental group 1 (DFC, $n = 74$), and experimental group 2 (ERISE, $n = 63$). Data were collected using a 30-item multiple-choice test (targeting cognitive levels C2–C4; Cronbach's Alpha = 0.65) and performance assessments using a rubric based on the 2023 National Competency Test. Statistical analysis included normality and homogeneity testing, followed by the Kruskal–Wallis test for group comparisons. Results revealed significant differences among the three groups in both knowledge and skill outcomes ($p < 0.001$). ERISE and DFC yielded higher knowledge scores than WE, although all groups scored below 70. In terms of skills, ERISE and DFC outperformed WE, with mean scores above 75. The findings suggest that purpose-built digital platforms like ERISE and DFC are more effective than default operating system tools for archival learning. However, the low average knowledge scores highlight the need for instructional strategies that balance practical application with theoretical understanding.

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1. INTRODUCTION

Vocational education has a strong responsibility to provide a workforce that meets the demands of the digital era (DKSDPTV, 2023). In particular, preparing skilled workers in the field of archival management requires the integration of technology into the learning process (Wright & Benoit, 2019). Previous research has widely recommended that vocational higher education should be able to align curricula with the development of knowledge and skills of graduates in accordance with labor market

demands in archival management (Bramantya, 2020; Hernawati, Santoso, & Muhidin, 2022; Sawaliyah, 2022; Suparyati & Habsya, 2024). As emphasized by Giraldo-Martínez, Atienza-Ubeda, Gómez-Sánchez, Jiménez-Medina, & Rojas-Arenas, (2022), vocational education has a major responsibility to produce graduates who meet the requirements of the digital era.

The integration of technology in vocational learning has many advantages. Inderanata, Sukardi, Sudira, Purwaningsih, & Priyanto (2023), through their research, revealed that technology integration in vocational learning increases students' interest and motivation to learn. In addition, the use of interactive technology improves the quality of classroom learning while also increasing activeness in the learning process (Y. Guo & Zhai, 2024). More importantly, technology integration can bring students' learning experiences and environments closer to those found in industry (Yu, 2021). n In line with this, the integration of information and communication technology has the potential to improve the quality of education, preparing learners to face a technology-driven world (Ramaila & Molwele, 2022; Tomar & Soni, 2024). Specifically in archival learning, digital technology plays an essential role as it is needed in managing large databases, such as creating metadata and retrieving information within an information system (Ho, 2011).

Previous studies have widely utilized technology in learning, particularly in facilitating document management processes., Puspitasari & Rizal Gaffar (2024), for example, developed a Microsoft Access-based official document storage application for document management at KAI Company. Another study by Costoiu et al. (2012), developed a document management system at a university with the help of Microsoft Office. Furthermore, Syarifatunnisa & Firmansyah (2023) developed an electronic filing system using built-in applications such as Microsoft Access. On the other hand, web-based document management systems (DMS) offer greater opportunities than other applications, especially in educational institutions. Nagrama et al. (2024) developed a web-based document management system that can serve as a solution for document management in educational institutions in the Philippines. As emphasized by Guo, Jahren, & Turkan, (2021), DMS can improve time efficiency as it facilitates data sharing among users. Evidence from previous studies confirms that technological developments have a major influence on document management practices in organizations or companies.

In the field of education, numerous studies have introduced a variety of established technologies into classroom settings, particularly in the context of Digital Record Management learning. These include the integration of web-based archival management applications and other readily available digital tools (Mewengkang et al., 2022; Pahlevi et al., 2023; Putri & Pahlevi, 2023; Sutirman, Yuliansah, Muslikhah, & Isti, 2023; Tarigan & Jumino, 2018). For instance, the use of Microsoft Access in archival instruction within vocational education has been shown to enhance student learning outcomes (Kuswantoro, 2017; Mufarridah & Susantiningrum, 2024).

Sutirman (2020) proposed the Digital File Cabinet (DFC) as an alternative application for archival learning. This tool is lightweight, simple to use, requires minimal storage, and supports efficient document management. Similarly, Jannah, Wulandari, and Hariyati (2024) developed an application using Microsoft Access to facilitate archival instruction.

An advanced example is presented by Sutirman and Yuliansah (2025), who designed a web-based Document Management System (DMS) known as ERISE (Electronic Record Information System for Education), modeled after professional organizational systems. According to Sutirman et al. (2022), ERISE offers students a comprehensive experience in managing documents through the entire archival process. Despite the emergence of these specialized applications, traditional tools such as Windows Explorer remain reliable for basic document management tasks on personal computers (Wang, 2016).

Many previous studies have explored the use of learning technologies and their impact on learning outcomes. Web-based learning has been shown to make it easier for students to acquire knowledge through digital platforms (Nababan et al., 2023; Padmesh & Sreeya, 2019), foster active learning (Asuman, Khan, & Mubarak, 2021), improve students' knowledge (Chiriac, 2022; Reyad et al., 2019), and enhance students' skills in archival learning (Putri & Pahlevi, 2023). On the other hand, the use of built-in applications such as Microsoft Explorer has become common as a practical tool for

document management, Arifianto et al. (2018); Sutirman (2020) explained that Windows Explorer features can facilitate digital document management on computers.

Although many studies have examined the impact of web-based learning and other tools on improving knowledge and skills, there has been little testing that simultaneously involves various ICT tools in learning, such as web-based platforms, learning applications, and built-in operating system features. The use of ERISE as a practicum medium has been studied by Sutirman et al. (2023); Sutirman, Yuliansah, & Muslikhah (2022), with notable results showing that it provides better practicum experiences. However, there has been no prior research experimenting with the use of DFC as a practicum medium for document management in vocational education. Therefore, this study seeks to fill this gap, which is important to obtain a real picture of which ICT tools are most effective in archival learning in vocational education. Rutania, Isyawati, Ganggi, & Korespondensi (2021) also added that most students are already proficient in using Windows Explorer as part of their academic life. Thus, with this comparison, it should be possible to identify which technology has a significant impact on archival learning. Accordingly, the objectives of this study are to examine: (1) the differences in students' knowledge levels in archival practice learning using ERISE, Digital File Cabinet, and Windows Explorer; and (2) the differences in students' skill levels in archival practice learning using ERISE, Digital File Cabinet, and Windows Explorer.

2. METHODS

This study employed a post-test only control group experimental design. The research procedures were as follows: (1) determining the course learning outcome (CLO) sub-competency for the study, namely students' ability to practice archival management using the subject system; (2) conducting online learning activities over four sessions, which included explanation of practicum and assessment, group assignments, independent practice, and testing; (3) prior to the experiment, students were asked to fill out a consent form via Google Form; (4) students were then randomly assigned through a Moodle-based learning management system (Besmart) into three groups: a control group of 74 students, experiment group 1 with 74 students, and experiment group 2 with 63 students. The control group used Windows Explorer (WE), while experiment group 1 used the Digital File Cabinet (DFC) application, and experiment group 2 used the ERISE website. After completing the practicum activities, students submitted their assignments and took a post-test.

The population of this study consisted of all 214 students enrolled in the Archival Management course at the Faculty of Vocational Studies. The sampling technique used was saturated sampling, in which the entire population was included as respondents.

Data collection employed both test and non-test methods. The test instrument was designed to measure students' knowledge of electronic records management using various practice media (ERISE, DFC, and WE). The instrument consisted of 30 multiple-choice questions with five answer options.

Table 1. Test Spesification

Cognitive Level	Items
C2	1, 2, 3, 4, 5, 6, 7, 8, 9, 10
C3	11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22
C4	23, 24, 25, 26, 27, 28, 29, 30
Items total	30 items

Before the test was administered to students, construct validity was examined by involving one expert lecturer in office administration, resulting in validity coefficients ranging from 0.4 to 0.5. Reliability testing using Cronbach's Alpha yielded a value of 0.65. The performance assessment adopted tasks from the National Competency Test (UKK) issued by the Ministry of Education and

Culture in 2023. The assessment process used a 5-point rubric (very poor, poor, fair, good, very good). To ensure that students received sufficient information about the practicum activities, the lecturer provided detailed instructions and assessment guidelines through the Besmart learning platform (see Figure 1).

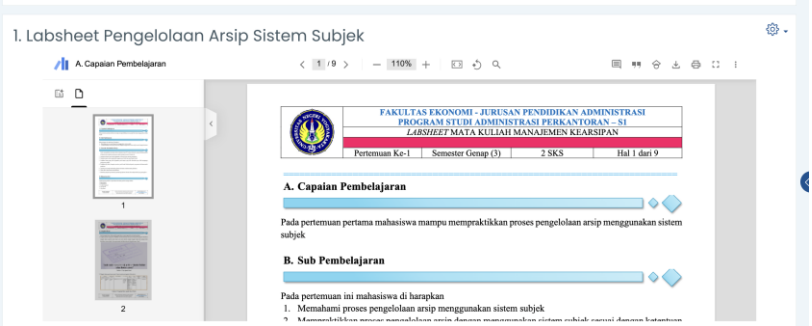

Figure 1 Practicum Jobsheet

Data analysis in this study included normality testing, homogeneity testing, and descriptive statistical analysis. Hypothesis testing was conducted using comparative tests with the JASP application. JASP is an open-source statistical analysis software built on R, which provides direct results with user-friendly output and supports peer review without the need for syntax (Love et al., 2019).

3. FINDINGS AND DISCUSSION

3.1 Findings

This study presents the findings in three parts: the results of descriptive statistical analysis, the prerequisite tests, and the hypothesis testing. The first stage focuses on the descriptive statistical analysis, the results of which are presented in Table 1.

Table 2. Results of Descriptive Statistical Analysis

	ERISE		*DFC*		*WE*	
	Knowledge	**Skill**	**Knowledge**	**Skill**	**Knowledge**	**Skill**
Mean	67.73	83.42	62.68	78.80	50.14	66.43
SD	12.06	10.01	11.83	12.61	18.45	15.97
Minimum	46.67	62.502	26.67	50	10	43.89
Maximum	86.67	97.501	80	100	80	95.28
Count	67	67	74	74	73	73

Table 2 shows that practical learning using the three applications has not provided an optimal impact on knowledge acquisition, as indicated by the average student knowledge scores remaining below 70 for all applications. The highest average score in the knowledge aspect was achieved through ERISE (67.73), followed by DFC (62.68), and the lowest was Windows Explorer (50.14). This indicates that the use of digital-based applications still has limitations in enhancing the theoretical understanding of electronic records management. This is because, during the practicum, students did not learn the theoretical aspects of the subject classification system but instead focused only on technical or practical processes. This finding is further supported by the results in the skills aspect. Students who practiced using ERISE achieved better outcomes with an average score of 83.42, higher than DFC (78.80). In contrast, learning with Windows Explorer produced the lowest skill achievement, with an average score of 66.43. These results suggest that ERISE is more effective in improving students' skills in

archival practice compared to the other two applications. A comparison of knowledge and skill achievement in archival practice learning can be seen clearly in Figure 1 below.

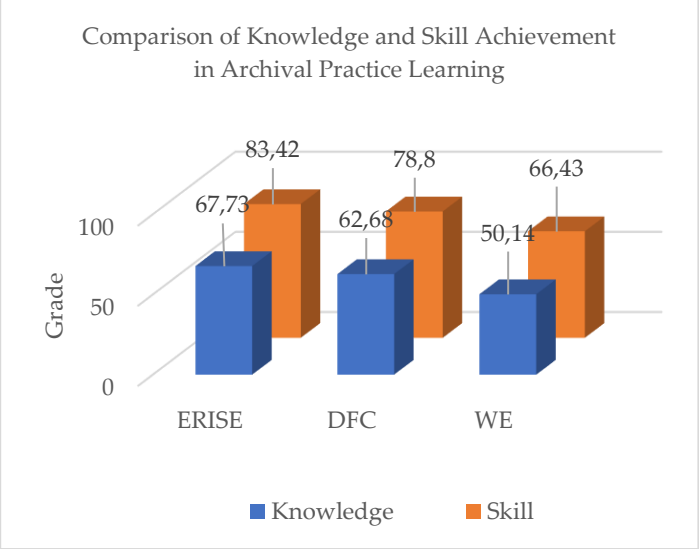

Figure 2. Comparison of Knowledge and Skill Achievement in Archival Practice Learning

Subsequently, the researcher conducted prerequisite tests as a necessary step before hypothesis testing. The results of the prerequisite tests are presented in Table .

Table 3. Normality Test Results

Variable	W-Statistic	P-Value	Interpretation
Knowledge	0.95935	0.0003475	Not Normally Distributed
Skills	0.94837	< 0.00001	Not Normally Distributed

Table 4. Homogeneous Test Result

Variable	F-Statistic	P-Value	Interpretation
Knowledge	0.9116	0.3413	Variances are Homogeneous
Skills	5.1486	0.05481	Variances are Homogeneous

Table 3 shows that the data for the learning outcomes of 'knowledge' and 'skills' are not normally distributed. Meanwhile, the homogeneity test presented in Table 3 indicates that the variances for both variables are homogeneous. Therefore, hypothesis testing was conducted using the Kruskal–Wallis test. Hypothesis testing was divided into two variables to examine: (1) whether there are differences in students' knowledge when learning through the ERISE website, the DFC application, and Windows Explorer, and (2) whether there are differences in students' skills when learning through the ERISE website, the DFC application, and Windows Explorer.

3.1.1 Knowledge Aspects

An alternative non-parametric test to ANOVA, namely the Kruskal–Wallis test, was conducted to examine whether there were differences in students' knowledge when learning through the ERISE website, the Digital File Cabinet application, and Windows Explorer. The results of this test are presented in Table 4 below.

Table 5. Kruskal-Wallis Test (Knowledge)

Factor	Statistic	df	p
Knowledge	36.449	2	< .001

Table 5 presents the results of hypothesis testing using the Kruskal–Wallis test. The Kruskal–Wallis test produced a p-value of 0.001 (< 0.05), so H0 was rejected and Ha was accepted. This means that at least one group showed significantly different scores in students' knowledge tests of archival practice learning. Since H_0 was rejected, a post hoc test was carried out using the Dunn–Bonferroni method on the students' knowledge test scores. The results of the multiple comparisons using the Dunn–Bonferroni method are presented in Table 6.

Table 6. Dunn-Bonferroni *Test* (Knowledge)

Comparison	z	p	p_{bonf}	Interpretation
ERISE – DFC	1.953	0.051	0.152	Fail to reject H_0
ERISE – WE	5.890	< .001	< .001	H_0 Rejected
DFC – WE	4.045	< .001	< .001	H_0 Rejected

Note. Rank-biserial correlation based on individual Mann-Whitney test

The hypothesis testing was based on the *pbonf* value. Table 6 shows that the comparison between the ERISE and DFC groups yielded a *pbonf* value of 0.152 or > 0.05, meaning that H0 was accepted. Thus, there was no significant difference between students using ERISE and those using DFC in the knowledge test of archival practice learning. In contrast, the comparisons between ERISE and WE, as well as between DFC and WE, produced a *pbonf* value of 0.001 or < 0.05, meaning that H0 was rejected. This indicates that there were significant differences between the ERISE and WE group, and between the DFC and WE group, in students' knowledge test results in archival practice learning.

Based on the Dunn–Bonferroni test results in Table 6, it can be concluded that the knowledge test scores of students using WE differed most significantly compared to those using ERISE and DFC. However, the WE group also had the lowest average score. This implies that learning through a website (ERISE) and an application (DFC) is more effective in improving students' knowledge than relying on built-in operating system features such as WE. A comparison of students' knowledge levels across the three archival practice learning media is illustrated in Figure 3.

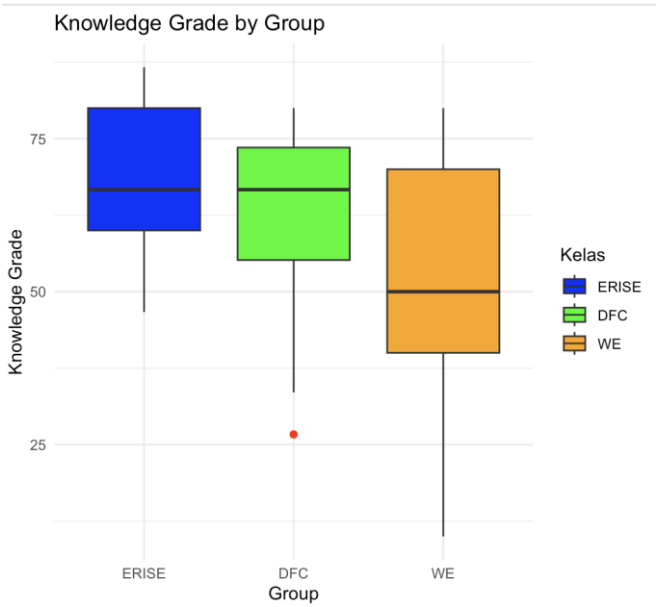

Figure 3. Comparison of Knowledge in Archival Practice Learning

Figure 3 illustrates that although the average knowledge achievement of students using ERISE and DFC was higher than that of those using WE, the scores remained below 70. This indicates that the learning process implemented has not yet produced an optimal impact on students' knowledge acquisition. Therefore, although ERISE and DFC proved to be more effective than WE, additional strategies are needed to further improve students' knowledge attainment. This also provides a clear

picture that, although technology integration has been applied in the learning process, it does not necessarily guarantee better knowledge outcomes in academic learning.

3.1.2 Skills Aspects

An alternative non-parametric test to ANOVA, namely the Kruskal–Wallis test, was conducted to examine whether there were differences in students' skills when learning through ERISE, DFC, and WE. The results of this test are presented in Table 4. The results are also presented in Table 7 below.

Table 7. Kruskal-Wallis Test (Skill)

Factor	Statistic	df	p
Skill	42.387	2	< .001

Table 7 presents the results of hypothesis testing using the Kruskal–Wallis test. Based on the test, a p-value of 0.001 (< 0.05) was obtained; therefore, H0 was rejected and Ha was accepted. This indicates that at least one group showed significantly different values in students' skill test results in archival practice learning. Since H0 was rejected, a post hoc test was conducted using the Dunn–Bonferroni method on students' skill test scores. The Dunn–Bonferroni results are presented in Table 8.

Table 8. Dunn-Bonferroni Test (Skill)

Comparison	z	p	p_{bonf}	Interpretation
ERISE – DFC	1.976	0.048	0.144	Fail to reject H_0
ERISE – WE	6.321	< .001	< .001	H_0 Rejected
DFC – WE	4.462	< .001	< .001	H_0 Rejected

Note. Rank-biserial correlation based on individual Mann-Whitney test

Table 8 shows that the comparison between the ERISE and DFC groups yielded a pbonf value of 0.144 (> 0.05), indicating that H0 was accepted. Thus, there was no significant difference between students using ERISE and those using DFC in the skills test of archival practice learning. In contrast, the comparisons between ERISE and WE, as well as between DFC and WE, produced pbonf values of 0.001 (< 0.05), indicating that H0 was rejected. This means that there were significant differences between the ERISE and WE groups, and between the DFC and WE groups, in students' skills test results in archival practice learning.

Based on the Dunn–Bonferroni test results presented in Table 8, it can be concluded that students' skills in archival practice learning using Windows Explorer differed most significantly compared to those using ERISE and DFC. However, the WE group also obtained the lowest average score. This suggests that learning through a website (ERISE) and an application (DFC) is more effective in improving students' skills than relying on built-in operating system features such as WE. A comparison of students' skill levels across the three archival practice learning media is illustrated in Figure 4.

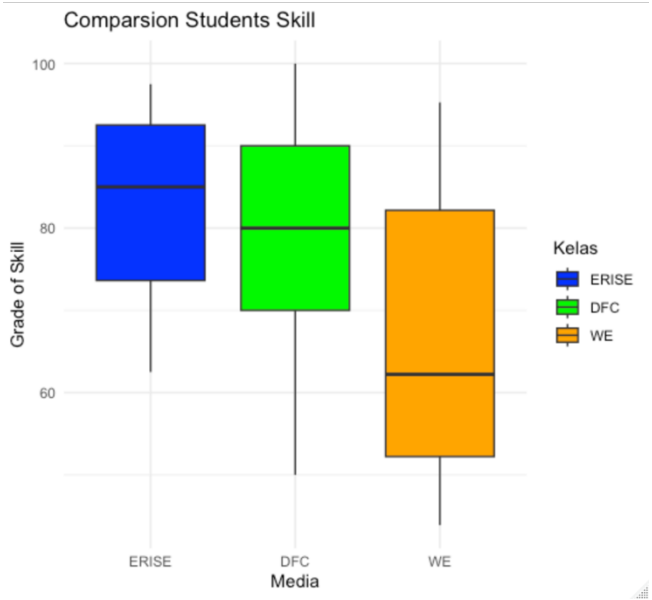

Figure 4. Comparison of Skills in Archival Practice Learning

Figure 4 illustrates that the average skill achievement of students using ERISE and DFC was higher compared to those using WE. Web-based archival practice learning with ERISE produced the highest skill scores, followed by DFC, while students who learned record management practice using WE achieved the lowest skill scores.

3.2 Discussion

Differences in Students' Knowledge in Digital Record Management Learning

The integration of technology into the learning process has long been a focus of researchers worldwide. With technology integration in learning, students' interest in studying can be increased, which in turn enhances their motivation (Inderanata et al., 2023). This is important, as one of the factors influencing learning performance is student motivation (Christodoulou, Tsagkaridis, & Malegiannaki, 2024). Guo & Zhai (2024) confirmed through their study that interactive technology can improve classroom learning quality, while strong evidence also shows that it fosters greater student engagement in the learning process.

The findings of this study indicate that knowledge test results in archival practice learning among students using WE differed most significantly compared to those using ERISE and Digital File Cabinet. However, the group using WE recorded the lowest average knowledge score. This finding contradicts the concept of experiential learning, in which students who learn independently through technology are expected to construct knowledge from their learning experiences (D. A. Kolb, 1984). This is reinforced by the fact that all three technologies used as practicum media in archival learning were designed primarily to develop skills, meaning that the experiences gained by students were stronger in the psychomotor domain rather than in the cognitive domain.

The ineffectiveness of web-based learning (ERISE) in helping students achieve higher levels of knowledge is consistent with Sutirman et al. (2022), who found that ERISE did not significantly improve knowledge in archival practice learning. These findings contrast with those of Mufarridah & Susantiningrum (2024); Wijaya, Herlina, & Widodo (2025), which showed that website-based practicum activities can improve students' knowledge outcomes. Furthermore, (Ghea Rizky & Bukhori, 2021) developed a website for electronic archival learning that was proven to enhance knowledge outcomes for vocational high school students. These results are inconsistent with the view of Nababan, Wijayanti, Rico, Nashrallah, & Sari (2023), who argued that web-based learning should facilitate students in acquiring knowledge more easily.

This study also reveals that learning with built-in applications and offline-installed archival management applications was equally ineffective in achieving optimal knowledge levels for students. In contrast, Jannah et al. (2024); Mufarridah & Susantiningrum (2024) showed that applications developed with Microsoft Access, one of the features available in operating systems, can help students achieve higher levels of knowledge. Similarly, Amalia & Panduwinata (2022) found that the use of Microsoft Access effectively supported information retrieval, thereby enhancing students' knowledge. Santoso, Ali Muhidin, & Winata (2023) further encouraged the development of archival management applications for secondary and higher education, particularly vocational education. This is crucial to ensure that vocational graduates not only have the skills required by industry but also possess sufficient knowledge to advance practical science (Direktorat Akademik Pendididikan Vokasi, 2022). Although vocational education emphasizes skills acquisition more than cognitive aspects, knowledge mastery still plays a vital role in the learning process (Setiyawami, Sugiyo, Sugiyono, & Rahardjo, 2020).

Variations in Students' Competencies in Digital Archival Education

Vocational education and industry are two inseparable domains. Vocational education aims to prepare its graduates with skills that are aligned with industrial needs (Billett, 2011; Cheng & Zhou, 2022; Paylova, 2009). Irwanto (2021)also emphasizes that vocational education is the educational pathway most closely connected to industry. In addition, classroom learning must provide students not only with knowledge but also with skills that are relevant to the digital era. Therefore, vocational graduates need to be equipped with specialized competencies in their respective fields, optimal job readiness, and digital-era skills (Abdurrahman et al., 2022; Irfansyah et al., 2023; Mahmudah & Santosa, 2021).

Learning facilitated by digital tools can increase students' motivation to learn(Girdzijauskienė, Norvilienė, Šmitienė, & Rupšienė, 2022). Digital platforms are also believed to enhance students' knowledge and skills while ensuring that graduates' competencies align with future industrial demands (Astuti, Arifin, Mutohhari, & Nurtanto, 2021; Branca et al., 2020).

The results of this study demonstrate that students' skills in archival practice learning using WE differed most significantly compared to those using ERISE and DFC. However, the group using Windows Explorer had the lowest average skill scores. This indicates that learning through the ERISE website and the DFC application is more effective in enhancing students' skills than relying on built-in operating system features such as WE. Web-based archival practice learning with ERISE yielded the highest skill scores, followed by DFC, while students who practiced archival management with WE achieved the lowest. This confirms that online learning through websites remains the most effective medium for improving students' skills, particularly in archival practice learning. These findings are consistent with prior studies by Sutirman et al., (2023), (2022) , which first tested ERISE in archival learning at vocational high schools and found that it significantly improved students' abilities in digital archival practice. ERISE provides students with a new experience in understanding document management procedures from beginning to end. These results reinforce earlier studies consistently proving that web-based learning can enhance students' skills (Girdzijauskienė et al., 2022; Hariadi et al., 2022; Shana, Naser, & Zeitoun, 2024; Simelane-Mnisi, 2023)

Furthermore, the findings of this study also provide empirical evidence that independent practice using ERISE contributes positively to students' understanding of digital records management. In accordance with (Dale, 1946) that learning carried out with real experience will have an impact on the absorption of learning up to 90%. Experiential learning also helps students acquire both knowledge and skills through self-reflection on their independent practice (A. Y. Kolb & Kolb, 2009). Other findings show that not only web-based learning but also application-based learning, such as DFC, proved equally effective in improving students' skills. Similar results were reported by Abduh (2022); Mufarridah & Susantiningrum (2024); Rismanto & Pahlevi (2022) , who found that application-based practicum media enhanced vocational students' skills in archival management.

Although this study shows that archival practice, particularly document management using WE, is not effective for improving student learning outcomes, this does not mean that WE cannot assist

users in managing documents Arifianto et al. (2018); Microsoft (2022); Wang (2016) assert that the main purpose of Windows Explorer is to help users organize and manipulate files stored on their computers. In other words, Windows Explorer can still be used to manage files for personal or organizational needs. Sutirman (2020) further stated that file management can be carried out using Windows Explorer to ensure that office documents and archives are stored neatly and systematically. Proper file management can improve office efficiency, particularly in archival storage, as it facilitates retrieval. Given that archival learning has been shown to be more effective through websites and applications specifically developed for records management, these findings can serve as a valuable consideration for educators in selecting appropriate learning media, particularly in vocational education.

4. CONCLUSION

Integrating technology into archival learning is a strategic effort to equip students with the knowledge and skills required in the digital era. This study shows that the use of Windows Explorer (WE) in digital archival learning resulted in the lowest levels of knowledge and skills compared to ERISE and DFC. This difference indicates that although WE is designed by default as a file management application in the Microsoft operating system, it has not provided an optimal contribution to archival learning. In contrast, applications that were specifically developed for managing digital archives and documents, such as ERISE and DFC, offer a more structured and systematic learning environment, making them more effective in supporting archival learning processes. Nevertheless, all three technologies (WE/ERISE/DFC) have not been able to significantly improve students' knowledge achievement overall. One possible reason is that the learning process using these technologies emphasizes practicum activities rather than knowledge acquisition. As a result, although students' skills improved, their knowledge scores did not reach the minimum expected level.

The practical implications of these findings provide recommendations for educators, particularly teachers and lecturers in office administration, to prioritize the integration of applications specifically designed for archival practice over built-in operating system applications. The use of ERISE is recommended because it was developed in line with the needs of electronic archival practice learning. Future studies may compare other available applications to examine their effects on improving knowledge and skills in archival learning. In addition, subsequent research could explore the integration of Artificial Intelligence into archival learning processes.

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