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Jurnal Teknologi Pendidikan

Journal homepage https://ejournal.upi.edu/index.php/edutech

Development of an Industry-Oriented Digital Archiving Simulation as an Interactive Learning Medium for Vocational Students

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ABSTRACT

This study aimed to develop and evaluate ARSIMDU (Archive Simulation for Digital Office) as an interactive digital learning medium for digital records management in the Office Management and Business Services vocational program. This Research and Development study adapted the Borg and Gall model into six stages: preliminary study, product development, expert validation and revision, field trials, and final revision and dissemination. ARSIMDU integrates instructional materials, digital archiving simulations, cognitive quizzes, competency monitoring, and learning reports. Validation scores were 88% from the media expert and 90% from the subject-matter expert, both categorized as Very Valid. Practicality scores were 87% in the small-scale trial with 35 students and 89% in the large-scale trial with 105 students, both categorized as Very Practical. These findings indicate that ARSIMDU meets the criteria for validity and practicality as a digital learning medium for vocational digital records management. However, the findings do not establish its effectiveness in improving students' digital records management competence.

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ARTICLE INFO

Article History:
Submitted/Received 28 Sept 2026
First Revised 18 Oct 2026
Accepted 25 Oct 2026
First Available online 31 Oct 2026
Publication Date 31 Oct 2026

Keyword:
ARSIMDU,
Digital records management,
Interactive learning media,
Learning simulation,
Vocational education.

1. INTRODUCTION

Research on digital transformation in records management indicates that the digitalization of archives has become an essential requirement for improving the efficiency, security, and accessibility of information across various organizations. (Amalia & Panduwinata, 2022; Nyfantoro et al., 2020) emphasize that the transition from manual to digital records management systems is a logical consequence of advances in information technology, while simultaneously requiring adaptive and professional human resources with competencies in digital records management. These developments reinforce the importance of developing digital records management

competencies, particularly among graduates of vocational education who are expected to perform administrative tasks in increasingly digital workplaces.

Within the context of vocational education, the development of relevant workplace competencies is an important component of preparing vocational high school graduates for professional practice. (Andhika, 2023; Handayani & Sari, 2018) emphasize that records management constitutes a core competency within office management education because it is directly associated with administrative effectiveness and workplace decision-making. Therefore, records management learning needs to provide not only conceptual understanding but also opportunities for students to develop procedural competencies through practical and contextualized learning experiences.

Nevertheless, several studies have revealed a gap between the competencies expected in professional practice and the learning experiences provided to vocational high school students. (Hidayah, 2023; Rismanto & Pahlevi, 2022) found that records management instruction in vocational schools remains predominantly theory-oriented and has not yet provided sufficiently contextualized practical learning experiences. Furthermore, the limited availability of digital records management learning facilities can prevent students from developing a comprehensive understanding of digital records management workflows that reflect workplace procedures (Nyfantoro et al., 2020). These conditions indicate the need for learning media that can provide students with opportunities to practice digital records management procedures systematically, repeatedly, and in a contextualized learning environment.

The preliminary needs analysis involved two vocational teachers and 35 students in the initial field investigation. The analysis identified that students experienced difficulties in applying digital records management procedures, particularly document classification, file naming, digital storage, and document retrieval. The learning process was also constrained by limited opportunities for contextualized digital records management practice and the absence of an integrated simulation environment representing workplace-oriented records management procedures. Although the available facilities supported computer-based learning and access to digital learning resources, they did not provide an integrated environment in which students could practice the complete digital records management workflow. These findings provided the basis for identifying the learning requirements and determining the features incorporated into the Digital Archiving Simulation, including instructional materials, practical simulations, quizzes, competency progress monitoring, and learning reports.

In response to these challenges, recent studies have increasingly focused on the development and implementation of technology-based learning media. (Budiarto & Jazuli, 2021; Pradana & Nasution, 2023) argue that interactive learning media can create more meaningful, active, and contextual learning experiences. Simulation-based media, in particular, provide opportunities for students to practice work procedures in environments that resemble real workplace settings while allowing errors to be identified and corrected during the learning process (Haerana et al., 2021). Such learning environments are particularly relevant to vocational education because they enable students to connect theoretical knowledge with procedural practice before encountering similar tasks in professional settings.

Several studies have investigated the use of digital simulation media in vocational education. (Ramadhani & Pahlevi, 2023) demonstrated that digital simulation can support students' procedural understanding of records management. Likewise, (Permansah et al., 2023) found that digital records management simulations can support students' accuracy, responsibility, and systematic thinking. In addition, technology-based

DOI: https://doi.org/10.17509/e.v25i3.105090
P-ISSN 0852-1190 E-ISSN 2502-0781

simulation media have been associated with students' learning motivation and engagement through interactive features and immediate feedback (Pratiwi et al., 2021). However, existing studies have generally examined digital learning media, individual learning activities, or particular records management procedures rather than providing an integrated environment that represents the complete sequence of digital records management activities.

Despite these advancements, studies specifically aimed at developing and evaluating a Digital Archiving Simulation as an interactive learning medium that represents the sequential processes of digital records management in professional workplaces remain limited, particularly for students enrolled in office management vocational education. Previous studies have provided valuable evidence regarding the potential of digital and simulation-based learning; however, they have not sufficiently integrated the complete digital records management workflow with instructional content, practical activities, assessment, and competency monitoring within a single learning environment. This gap highlights the need for an integrated learning medium that can connect knowledge acquisition, procedural practice, assessment, and competency monitoring in digital records management learning.

To address this gap, the present study develops the Digital Archiving Simulation as an integrated interactive learning medium for digital records management. The distinctive contribution of the developed medium lies in the integration of instructional materials, practical digital archiving simulations, cognitive quizzes, competency progress monitoring, and learning reports within a single learning environment. The simulation represents key digital records management processes, including document classification, file naming, digital storage, and retrieval, enabling students to practice these procedures in a structured and contextualized environment. Through this integration, the developed medium is intended to provide a more comprehensive learning experience than media that primarily present instructional content or isolated practical activities.

Therefore, the present study aims to develop and evaluate a Digital Archiving Simulation as an interactive learning medium for vocational students' digital records management learning. The evaluation focuses on the validity and practicality of the developed learning medium as a basis for determining its suitability for use in vocational learning. By integrating instructional content, simulation-based practice, assessment, and competency monitoring, this study seeks to contribute an alternative digital learning environment that strengthens the connection between school-based records management learning and the procedural requirements of the workplace.

2. METHODS

2.1. Research Design

This study employed a Research and Development (R&D) approach adapted from the Borg and Gall development model (Borg & Gall, 1983). The original model was modified into six major stages to suit the characteristics of vocational learning media development and the context of Office Management and Business Services vocational education. The adaptation retained the core activities of preliminary investigation, product development, expert validation, field testing, revision, and dissemination, while consolidating related activities into a more feasible development procedure. The six stages consisted of: (a) Preliminary Study, (b) Initial Product Development, (c) Expert Validation and Product Revision, (d) Small-Scale Field Trial, (e) Large-Scale Field Trial, and (f) Final Revision and Product Dissemination.

DOI: https://doi.org/10.17509/e.v25i3.105090
P-ISSN 0852-1190 E-ISSN 2502-0781

Table 1. Adaptation of the Borg and Gall development model for ARSIMDU development.

Original Borg and Gall Activities	Adapted ARSIMDU Development Stage
Research and information collecting	Preliminary Study
Planning and develop preliminary form of product	Initial Product Development
Preliminary field testing and main product revision	Expert Validation and Product Revision
Main field testing	Small-Scale Field Trial
Operational field testing and operational product revision	Large-Scale Field Trial
Final product revision and dissemination	Final Revision and Product Dissemination

2.1.1. Preliminary Study

The preliminary study consisted of a field study and literature review. The field study involved two vocational teachers and 35 students to identify learning conditions, students' difficulties, available facilities, and learning needs related to digital records management. The literature review examined digital records management, vocational learning, simulation-based learning, and relevant curriculum and workplace-related competencies.

2.1.2. Initial Product Development

This stage consisted of an operational design seminar and the development of learning materials. ARSIMDU was designed based on the findings of the preliminary study, curriculum requirements, and identified digital records management competencies. The product incorporated instructional materials, practical digital archiving simulations, cognitive quizzes, competency progress monitoring, and learning reports.

2.1.3. Expert Validation and Product Revision

The initial ARSIMDU product was validated by one media expert and one subject-matter expert. The media expert had expertise in educational technology and digital learning media, particularly in interface design, usability, navigation, interactivity, and technical functionality. The subject-matter expert had expertise in Office Management and Digital Records Management, particularly archival management and vocational learning competencies. The experts were selected based on their relevant expertise in evaluating digital learning media and archival learning content.

The media and subject-matter expert validation instruments each consisted of 10 items rated on a five-point scale, with a maximum possible score of 50. The product was revised based on the experts' recommendations before being tested in the field.

2.1.4. Small-Scale Field Trial

The small-scale field trial involved 35 Grade XI students from XI MP 2 at SMKS PGRI 1 Tulungagung. The students were enrolled in the Office Management and Business Services specialization. Data were collected through teacher and student response questionnaires, observations, and interviews to identify usability problems, user responses, and areas requiring improvement. The findings were used to improve the product before the large-scale field trial.

DOI: https://doi.org/10.17509/e.v25i3.105090
P-ISSN 0852-1190 E-ISSN 2502-0781

2.1.5. Large-Scale Field Trial

The large-scale field trial involved 105 Grade XI students from XI MP 1, XI MP 2, and XI MP 3 at SMKS PGRI 1 Tulungagung. Data were collected through teacher and student response questionnaires, observations, and interviews. The findings were analyzed to determine the practicality of ARSIMDU and to identify aspects requiring final improvement.

2.1.6. Final Revision and Product Dissemination

The final stage involved refining ARSIMDU based on the results of the large-scale field trial and preparing the product for broader implementation in vocational high schools. Dissemination was conducted by preparing the final version of ARSIMDU for potential use in Office Management and Business Services vocational learning.

2.2. Participants and Instruments

The participants consisted of one media expert, one subject-matter expert, two vocational teachers, and Grade XI students of the Office Management and Business Services specialization at SMKS PGRI 1 Tulungagung. The student participants were from XI MP 1, XI MP 2, and XI MP 3. The preliminary study involved 35 students and two vocational teachers. The small-scale field trial involved 35 students from XI MP 2, while the large-scale field trial involved 105 students from XI MP 1, XI MP 2, and XI MP 3. Participants were selected based on their involvement in Office Management and Business Services learning and their relevance to the implementation of the developed learning media.

Data were collected using expert validation sheets, teacher and student response questionnaires, observation sheets, and interview guidelines. The media and subject-matter expert validation instruments each consisted of 10 items rated on a five-point scale, resulting in a maximum possible score of 50 for each instrument. The blueprints of the two expert validation instruments are presented in Tables 2 and 3.

Table 2. Blueprint of the media validation instrument.

No.	Assessment Aspect	Item
1	Interface Design and Visualization	1
2	Navigation and Interactivity	2
3	Responsiveness Across Devices	3
4	Aesthetics and Layout Consistency	4
5	Relevance to Learning Objectives	5
6	Accessibility	6
7	Suitability of Format and Output	7
8	Creativity and Innovation	8
9	Technical Functionality	9
10	User Experience (UX)	10

Table 3. Blueprint of the subject-matter expert validation instrument.

No.	Assessment Aspect	Item
1	Curriculum Alignment	1
2	Content Relevance	2
3	Content Depth and Integration	3
4	Clarity of Learning Objectives	4

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P-ISSN 0852-1190 E-ISSN 2502-0781

No.	Assessment Aspect	Item
5	Information Accury	5
6	Engangement and Interactivy	6
7	Language Use	7
8	Content Completeness	8
9	Relevance to the workplace	9
10	Suitable of the Digital Archiving Simulation	10

2.3. Data Analysis

Quantitative data were analyzed using percentage scores calculated using the following formula:

$$P = (f / N) \times 100\% \quad (1)$$

where P is the percentage score, f is the obtained score, and N is the maximum possible score. Expert validation results were used to determine the validity of the developed media, whereas teacher and student responses from the field trials were used to determine its practicality. The resulting percentage scores were interpreted according to the criteria presented in Table 4.

Table 4. Criteria for validity and practicality.

Percentage Score	Validity Criteria	Practicality Criteria
81–100%	Very Valid	Very Practical
61–80%	Valid	Practical
41–60%	Fairly Valid	Fairly Practical
21–40%	Less Valid	Less Practical
0–20%	Invalid	Impractical

Source: Adapted from Sugiyono (2017)

Qualitative data obtained from observations and interviews were analyzed descriptively to identify user responses, suggestions, and recommendations for product improvement. These qualitative findings were used to complement the quantitative validity and practicality results and to guide product revisions.

2.4. Industry-Oriented Alignment

The development of ARSIMDU was guided by curriculum requirements, identified competency needs, and workplace-related digital records management procedures, particularly document classification, file naming, digital storage, and document retrieval. The industry-oriented characteristic of ARSIMDU therefore refers to the alignment of the simulation with curriculum and workplace-related requirements rather than direct validation by industry practitioners. The alignment is presented in Table 5.

Table 5. Curriculum and workplace-oriented alignment of ARSIMDU.

Curriculum/Competency	ARSIMDU Simulation Activity	Workplace-Related Competency
Document classification	Classifying digital documents according to types and categories	Systematic records organization

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P-ISSN 0852-1190 E-ISSN 2502-0781

Curriculum/Competency	ARSIMDU Simulation Activity	Workplace-Related Competency
File naming	Applying standardized file-naming conventions	Consistent digital records identification
Digital storage	Storing documents in appropriate digital folders	Structured digital records storage
Document retrieval	Searching for and retrieving required documents	Efficient records retrieval
Digital records management	Completing sequential digital archiving activities	Application of digital records management procedures

3. RESULTS AND DISCUSSION

3.1. Results

This study resulted in the development of a web-based interactive learning medium called ARSIMDU (Archive Simulation for Digital Office), which is accessible at https://andiebasuki-afk.github.io/ARSIMDU-V2/. ARSIMDU is an interactive digital learning platform designed to simulate electronic records management processes in a modern office environment. The platform provides instructional materials, practical digital archiving simulations, cognitive quizzes, competency progress monitoring, and learning reports within an integrated learning environment. The simulation activities cover several essential digital records management procedures, particularly document classification, file naming, digital storage, and document retrieval.

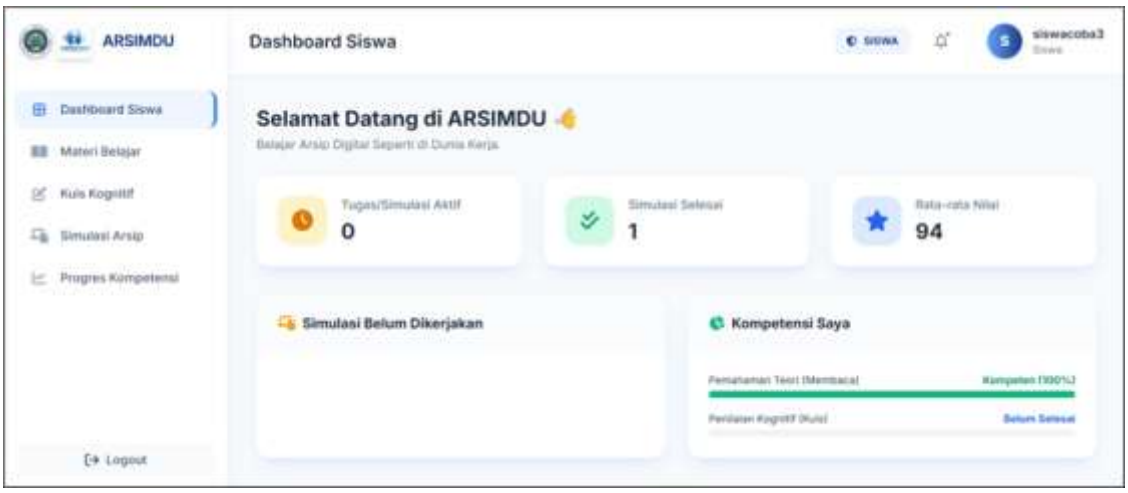


Figure 1. ARSIMDU student dashboard.

The development of ARSIMDU was initiated through a preliminary needs analysis involving two vocational teachers and 35 students in the Office Management and Business Services program. The analysis indicated that teachers needed learning media that could facilitate practical digital records management activities, while students needed opportunities to practice digital archiving procedures in a more interactive learning environment. These findings became the basis for developing a web-based simulation that combines conceptual materials with opportunities for procedural practice.

ARSIMDU was developed according to the learning requirements of the Office Management and Business Services curriculum. The content covers digital records management procedures, including document classification, filing systems, indexing, file

DOI: https://doi.org/10.17509/e.v25i3.105090
P-ISSN 0852-1190 E-ISSN 2502-0781

naming, digital storage, and retrieval. The development also considered workplace-related procedures in digital records management. However, the study did not involve direct validation by industry practitioners or professional archivists. Therefore, the term *industry-oriented* in this study refers to the alignment of the learning content and simulation activities with curriculum requirements and workplace-related digital records management procedures rather than direct validation by industry.

A distinctive characteristic of ARSIMDU is the integration of several learning components within one digital platform. The platform combines instructional materials, digital archiving simulations, cognitive quizzes, competency progress monitoring, and learning reports. The integration allows students to move from understanding concepts to practicing digital records management procedures within the same learning environment. The simulation is organized around a sequence of activities that reflects the logical relationship among classification, file naming, storage, and retrieval.

The expert validation results are presented in Table 6.

Table 6. Results of expert validation.

Evaluation Aspect	Maximum Score	Obtained Score	Percentage	Category
Media validation	50	44	88%	Very Valid
Material validation	50	45	90%	Very Valid

The media validation obtained a total score of 44 out of 50, resulting in a validity percentage of 88%. Based on the predetermined criteria, the result was categorized as Very Valid. The media expert assessed ten indicators covering interface design, navigation and interactivity, responsiveness across devices, aesthetics and layout consistency, relevance to learning objectives, accessibility, suitability of format and output, creativity and innovation, technical functionality, and user experience.

The material validation obtained a total score of 45 out of 50, corresponding to a validity percentage of 90% and classified as Very Valid. The material expert evaluated curriculum alignment, content relevance, content depth and integration, clarity of learning objectives, information accuracy, engagement and interactivity, language use, content completeness, relevance to workplace-related procedures, and suitability of the digital archiving simulation.

Following expert validation and product revision, ARSIMDU was implemented in two field trials. The small-scale trial involved 35 students from XI MP 2, while the large-scale trial involved 105 students from XI MP 1, XI MP 2, and XI MP 3. The trials focused on the practicality of the learning medium based on user responses. The results are presented in Table 7.

Table 7. Results of practicality trials.

Trial Stage	Participants	Instrument	Percentage	Category
Small-scale trial	35 students	Practicality questionnaire	87%	Very Practical
Large-scale trial	105 students	Practicality questionnaire	89%	Very Practical

The small-scale trial produced a practicality score of 87%, while the large-scale trial produced a score of 89%. Both results were categorized as Very Practical. These findings indicate that the developed medium was perceived as practical by users in terms of its

DOI: https://doi.org/10.17509/e.v25i3.105090
P-ISSN 0852-1190 E-ISSN 2502-0781

usability, clarity, accessibility, and applicability within digital archiving learning activities.

The results of the expert validation and field trials indicate that ARSIMDU met the predetermined criteria for validity and practicality. However, these results should not be interpreted as evidence of the effectiveness of ARSIMDU in increasing students' archival competence because the present study did not provide sufficient quantitative evidence of learning gains through a pretest-posttest comparison or a separately analyzed performance assessment.

3.2. Discussion

The development of ARSIMDU responds to the need for learning environments that provide students with opportunities to practice digital records management procedures rather than relying exclusively on conceptual explanations. The preliminary needs analysis involving two teachers and 35 students indicated a need for practical digital learning media that could reduce dependence on physical documents and provide a more interactive environment for practicing electronic records management. This finding is consistent with previous studies reporting that archival learning in vocational education can remain strongly oriented toward theoretical instruction and requires more contextual learning experiences (Hidayah, 2023; Rismanto & Pahlevi, 2022).

The relevance of a digital simulation in archival learning can be explained by the procedural nature of records management. Competence in digital archiving is not limited to knowing the definitions of classification, filing systems, indexing, or retrieval; students also need to understand how these procedures are related. ARSIMDU provides a learning sequence in which students practice these procedures as interconnected activities. For example, an inappropriate classification can affect the subsequent storage location, while inconsistent file naming can make a document more difficult to retrieve. The retrieval activity therefore provides an opportunity for students to recognize the practical consequences of earlier decisions. This mechanism makes the simulation pedagogically relevant because students can practice procedures and observe the relationship between individual steps within digital records management.

This finding is in line with the principle of simulation-based learning reported by Haerana et al. (2021), in which simulation provides opportunities for learners to practice procedures in a controlled learning environment. In the context of digital archiving, the value of simulation lies not merely in presenting a digital interface but in allowing students to repeatedly practice procedural decisions without the operational risks associated with handling organizational records. Thus, ARSIMDU functions as a practice environment in which students can work through digital records management procedures before encountering more complex professional contexts.

Another important characteristic of ARSIMDU is the integration of learning components into a single platform. The platform brings together instructional materials, practical simulations, cognitive quizzes, competency progress monitoring, and learning reports. This integration represents the main product-level contribution of the development because students do not need to move between separate learning resources to access conceptual explanations and practice activities. The instructional materials provide the conceptual foundation, the simulation provides procedural practice, the cognitive quizzes provide opportunities to check understanding, and the monitoring and reporting components provide information about learning progress.

The integration of these components also creates a logical relationship between knowledge and practice. Students can first access the relevant concept, apply the concept through simulation, and subsequently check their understanding through cognitive

DOI: https://doi.org/10.17509/e.v25i3.105090
P-ISSN 0852-1190 E-ISSN 2502-0781

quizzes. Consequently, the contribution of ARSIMDU is not simply the digitization of archival materials but the integration of learning content and procedural simulation in a web-based learning environment. This characteristic distinguishes the product conceptually from learning media that provide only digital materials or isolated practice activities. Nevertheless, the claim should be understood as a product-development contribution based on the design of ARSIMDU rather than as evidence that ARSIMDU is superior to all previously developed archival media.

The validation results provide empirical support for the quality of the developed product. The media expert validation score of 88% was categorized as Very Valid, indicating that the interface, navigation, responsiveness, accessibility, and technical functionality met the predetermined criteria. The material expert validation score of 90%, also categorized as Very Valid, indicates that the instructional content and simulation activities were considered appropriate in relation to the intended curriculum and digital records management learning requirements. These findings support the use of ARSIMDU as a learning medium, although the use of one media expert and one subject-matter expert means that the validation results should be interpreted with caution because expert judgment from a limited number of validators may not represent the full range of possible evaluations.

The practicality results provide additional evidence concerning the usability of the product. The small-scale trial resulted in 87%, while the large-scale trial resulted in 89%, and both were categorized as Very Practical. The increase between the two trial stages suggests that the product was consistently perceived as practical when implemented with a larger group of students. However, the practicality scores represent users' perceptions of the product and should not be interpreted as direct evidence of improved archival competence.

The relationship between simulation and competence should therefore be interpreted through the learning opportunities provided by the product rather than through claims of measured improvement. The classification activity requires students to make decisions concerning document categories; the file-naming activity requires attention to consistency; the storage activity requires students to organize documents systematically; and the retrieval activity requires students to locate previously stored records. These activities provide repeated opportunities to practice procedural aspects of digital records management. In this sense, ARSIMDU can support competency development by providing structured practice, but the present study does not establish the magnitude of competency improvement.

The industry-oriented characteristic of ARSIMDU also requires careful interpretation. The simulation incorporates workplace-related digital records management procedures, particularly document classification, standardized file naming, digital storage, and retrieval. These procedures are relevant to contemporary office administration and therefore provide a reasonable basis for connecting vocational learning with workplace-related practices. However, because no industry practitioner or professional archivist participated in the validation process, the study cannot claim that ARSIMDU has been directly validated against specific industry standards. Future development could strengthen this aspect by involving practitioners from companies, records management units, or professional archival institutions in the validation and refinement of simulation scenarios.

The role of the teacher remains important even when digital simulation is used. ARSIMDU should not be regarded as a replacement for teacher instruction or supervision. In vocational learning, teachers are still needed to provide explanations, scaffolding,

DOI: https://doi.org/10.17509/e.v25i3.105090
P-ISSN 0852-1190 E-ISSN 2502-0781

correction, and reflection. For example, when students encounter difficulties in classification or retrieval, the teacher can help them identify the procedural relationship between the error and its consequences. The teacher can also connect the simulated experience with professional practices that may differ across organizations. Therefore, ARSIMDU is more appropriately positioned as a learning medium that supports teacher-facilitated vocational instruction rather than as an autonomous replacement for classroom instruction.

The positive practicality responses also need to be interpreted carefully in relation to student engagement and motivation. The field trials indicate that students responded positively to the use of the medium, but the study did not employ a dedicated instrument for measuring learning motivation or engagement. Therefore, the findings can be interpreted as indicating positive user perceptions or acceptance of the learning medium rather than as quantitative evidence of increased motivation. This distinction is important because motivation requires specific measurement if changes in motivation are to be established empirically.

Despite its potential, ARSIMDU has several limitations. First, implementation depends on the availability of computers or other compatible devices and adequate internet connectivity. Second, differences in students' and teachers' digital literacy may affect the ease with which the platform is used. Third, a web-based system requires continued technical maintenance and updating. Fourth, digital records management in actual organizations may involve specific software, metadata structures, access controls, security procedures, retention schedules, and organizational policies that cannot all be represented in a single educational simulation. Finally, the absence of direct industry-practitioner validation limits the strength of the claim that the simulation fully represents current industrial practice.

These limitations indicate that ARSIMDU should be understood as a structured educational simulation rather than a complete representation of organizational records management systems. Its primary value is to provide a controlled environment for students to practice fundamental digital records management procedures. Broader implementation should therefore be accompanied by teacher guidance, appropriate infrastructure, and periodic refinement of simulation scenarios based on curriculum developments and workplace requirements.

Overall, the findings demonstrate that ARSIMDU achieved strong expert validation results and was perceived as practical by students in both small- and large-scale trials. The results provide evidence for the validity and practicality of the developed learning medium. They do not, however, establish the effectiveness of ARSIMDU in increasing archival competence. Further empirical research is required to determine whether the opportunities for practice provided by the simulation result in measurable improvements in students' digital records management performance.

4. CONCLUSION

Based on the results, ARSIMDU (Archive Simulation for Digital Office) was developed as a web-based interactive learning medium for digital records management in the Office Management and Business Services vocational program. The product integrates instructional materials, practical digital archiving simulations, cognitive quizzes, competency progress monitoring, and learning reports within a single learning environment. The simulation focuses on workplace-related digital records management procedures, particularly document classification, file naming, digital storage, and document retrieval.

DOI: https://doi.org/10.17509/e.v25i3.105090
P-ISSN 0852-1190 E-ISSN 2502-0781

The media validation score was 88%, while the material validation score was 90%; both were categorized as Very Valid. The small-scale and large-scale trials produced practicality scores of 87% and 89%, respectively, and both were categorized as Very Practical. These findings indicate that ARSIMDU met the predetermined criteria for validity and practicality in the context of vocational digital archiving instruction.

The findings should be interpreted within the scope of the evidence provided by this study. The validity and practicality results support the quality and usability of the developed product, but they do not constitute evidence of improved student competence or learning effectiveness. In addition, the *industry-oriented* characteristic of ARSIMDU refers to its alignment with curriculum requirements and workplace-related digital records management procedures, as the study did not involve direct validation by industry practitioners.

Future research should examine the effectiveness of ARSIMDU using a more rigorous experimental design, such as a quasi-experimental pretest-posttest design involving experimental and control groups. Performance-based assessment of digital records management competence and, where relevant, delayed posttests could also be employed to examine learning gains and retention. Involving industry practitioners or professional archivists in future validation would further strengthen the workplace relevance of the simulation.

5. AUTHORS' NOTE

The authors declare that there is no conflict of interest related to the publication of this article. The authors confirm that this manuscript is an original work, has not been involved in any form of academic misconduct, and is free from plagiarism. All sources and references used in this study have been properly acknowledged in accordance with academic integrity principles.

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P-ISSN 0852-1190 E-ISSN 2502-0781