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Developing Peer Learning-Based Communication Simulation E-Modules to Enhance Soft Skills in Office Management Vocational Education

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Abstract: This study aims to develop an interactive e-module integrated with peer learning and workplace communication simulations to enhance students' communication skills. The research employed a Research and Development (R&D) method using the 4D model—Define, Design, Develop, and Disseminate. The product was validated by two subject matter experts and one media expert, and its effectiveness was tested through limited trials and expanded trials involving 60 students using pretest and posttest scores. Data were analyzed using quantitative and descriptive qualitative techniques. Qualitative data in the form of suggestions and feedback from validators were used to improve the e-module. Meanwhile, quantitative data were obtained from validation scores, teacher assessments, and student test results, which were analyzed to measure the feasibility and effectiveness of the product. The e-module received a validity score of 96% from content experts and 100% from the media expert, indicating high feasibility. Effectiveness trials showed a significant improvement in students' learning outcomes, with an average N-Gain of 0.751 in the limited trial and 0.791 in the expanded trial. Practical communication skills, including oral communication and workplace communication ethics, improved substantially, with simulation performance scores averaging 90.667 and 90.800 in two different classes. These results confirm the effectiveness of the interactive e-module in supporting the teaching of workplace communication and enhancing students' real-world communication competencies. Students' negotiation and persuasion skills showed the most significant improvement among the communication aspects assessed. Therefore, the developed module is suitable for use as a digital learning tool in vocational Office Management programs.

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Introduction

In the 21st century, professional skills are centered around four core competencies: literacy, creative thinking, effective communication, and high productivity (Zahroh et al., 2022). Communication skills in the Office Management field are a fundamental aspect that cannot be overlooked, as office administrators are expected to communicate professionally in both verbal and written forms. These skills are required in various administrative tasks such as handling phone calls, drafting business correspondence, managing emails, and coordinating with multiple stakeholders (Makiyah et al., 2021; E. Lee et al., 2022). In today's global and digitized workforce, communication competence has become more vital than ever. Effective communication is now regarded as a core competency, alongside problem-solving,

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collaboration, and critical thinking placing it at the heart of employability and adaptability in fast-paced professional environments (Makiyah et al., 2021).

Despite its significance, more than 65% of HR professionals in Indonesia report that vocational high school (SMK) graduates still struggle with professional communication, both spoken and written (FHCI, 2024). These challenges stem from limited opportunities for practical communication training in schools, often due to overly theoretical and text-based instruction. As a result, many graduates lack confidence in workplace interactions, such as presenting ideas, handling calls professionally, or writing structured reports (E. Lee et al., 2022). Furthermore, inadequate exposure to real-world communication practices leads to difficulty adapting to workplace dynaofmics, hindering graduates' employability. These findings indicate an urgent need for simulation-based and practice-oriented learning in SMKs, especially within Office Management programs.

Despite the growing urgency to strengthen students' communication competencies, several instructional challenges persist within the Office Management program at SMK Teuku Umar Semarang. The learning process is still heavily dominated by traditional methods such as lectures, discussions, and question-answer sessions, which offer limited opportunities for students to practice communication in real-life scenarios. Knowledge of communication theory is not automatically transferred into procedural skills in the workplace, making it difficult for students to apply communication concepts when faced with complex and dynamic professional situations.

Moreover, the underutilization of simulation-based learning in the *Workplace Communication* subject further hinders the development of practical communication skills. In addition, the use of uncontextualized teaching materials often downloaded directly from the internet without adaptation reduces the relevance and effectiveness of instruction. As a result, students do not develop the adaptive skills necessary to respond to various professional communication scenarios, such as handling conflicts, negotiating, or providing effective customer service.

This gap has serious implications for the employability of vocational school graduates, as reflected in the high unemployment rate among vocational school graduates, which is often caused by weak soft skills, particularly professional communication skills. Although the Indonesian National Qualifications Framework (KKNI) provides clear guidelines for the competencies that must be achieved, its implementation in communication learning remains suboptimal. These issues are compounded by the high unemployment rate among vocational school graduates, highlighting the critical need for enhanced soft skills training to improve employability. Furthermore, existing learning resources lack technological integration, making them less interactive and misaligned with both student learning preferences and evolving industry demands.

To address these gaps, education experts have recommended more innovative and contextual learning models. One such approach is Project-Based Learning (PjBL), which allows students to develop communication skills through direct involvement in real-world tasks (Putri & Hidayat, 2019; Oktarina et al., 2024). PjBL, particularly when integrated with simulations, offers practical experiences where students engage in workplace-like communication tasks, such as team discussions, professional presentations, and conflict resolution. These activities mirror the realities of office environments, allowing students to practice effective communication in varied professional contexts (Oktarina et al., 2024; Saeroji & Wirawan, 2024).

However, effective implementation of PjBL in the context of vocational education requires more than just project assignments and necessitates a framework that aligns learning

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activities with measurable industry competency standards. In this context, the e-module developed is not merely a digitization of text material into electronic format, but rather an integrated learning system that translates the competency descriptors of the Indonesian National Qualifications Framework (KKNI) into project-based workflows through interactive technology mediation. These Progressive Web App (PWA)-based e-modules provide a learning ecosystem in which students complete authentic communication projects, such as handling customer complaints, drafting business correspondence, and coordinating across departments, designed in line with KKNI level 2 standards for technicians/analysts. The interactive technology in the PWA platform serves as an infrastructure that facilitates situational simulations, provides real-time adaptive feedback, and guides structured reflection, ensuring that the PjBL experience is not only contextual but also measurable in terms of achieving the professional communication competencies demanded by the industry

With the advancement of technology and the demands of the Fourth Industrial Revolution, digital learning tools, especially e-interactive modules, are gaining attention as effective solutions for vocational schools (Zahidah et al., 2023; Diniyatushoaliha, 2024). Unlike static materials such as PDFs or PPTs, interactive e-modules offer multimedia features such as video tutorials, scenario-based exercises, and integrated quizzes, enabling flexible, engaging, and student-centered learning (Musa et al., 2024). This platform implements contextual digital scaffolding mechanisms through automatic and adaptive feedback features that respond to student performance in real-time, providing corrective guidance tailored to individual error patterns without manual intervention from teachers. Progressive Web App (PWA) technology facilitates asynchronous learning, allowing students to access communication simulations, such as customer complaint handling, business negotiations, and formal correspondence at any time and from any device with a consistent experience. Integrated multimedia features, including demonstrative video tutorials, casebased exercises with multiple decision pathways, and automated formative assessments, support the development of practical communication skills in authentic professional contexts. Moreover, web-assisted learning platforms enable real-time tracking of student performance, allowing teachers to pro.

Another important element in ensuring the relevance of instructional content is the alignment with the Indonesian National Qualifications Framework (KKNI), which defines nationally recognized competency standards (U. Lee et al., 2021). Incorporating KKNI into the development of e-modules ensures that communication skills taught in vocational schools meet industry expectations. This includes mastery of both oral and written professional communication, which is vital in administrative roles. KKNI-based e-modules help students not only understand communication theory but also apply it effectively in work-related scenarios, bridging the gap between education and employment (Rohmawati et al., 2023; Rahmadhani et al., 2021).

This study aims to develop an interactive, simulation-based e-module aligned with KKNI standards to enhance communication skills among students in the Office Management program at SMK Teuku Umar Semarang. The goal is to provide a contextual, engaging, and effective learning tool that bridges theoretical knowledge with practical application in workplace scenarios. The research addresses a critical gap in vocational education, offering a digital solution that not only supports skill development but also improves students' readiness for professional communication tasks in real-world settings (R. Efendi & Wiyatmo, 2021; Munir et al., 2023; Fitriasih & Wulandari, 2023).

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Research Method

This study employs a Research and Development (R&D) approach to develop an interactive e-module for the subject *Workplace Communication*, aiming to enhance communication skills among vocational high school students in the Office Management program. The product is designed based on the Indonesian National Qualification Framework (KKNI) to align with industry demands. The development model used is 4D (Define, Design, Develop, Disseminate) (Thiagarajan, 1974). The Define phase includes needs analysis, student characteristics analysis, and material review based on SKKNI standards. The Design phase focuses on creating a simulation-based e-module that integrates text, audio, video, quizzes, and project-based tasks relevant to professional communication scenarios.

A mixed-methods approach is adopted, combining qualitative methods (interviews, observations, and document analysis) to explore current classroom practices, and quantitative methods (pre-tests and post-tests) to assess the effectiveness of the e-module. This design ensures a comprehensive evaluation of the product's quality and its impact on students' communication competencies.

The participants of this study were students specializing in Office Management at SMK Teuku Umar Semarang during the 2024/2025 academic year. The sample included 90 students from grade XI, with a limited trial conducted on one class (30 students) and an extended trial involving two classes (60 students). Additionally, data were collected from key informants, including one Workplace Communication subject teacher and one Office Management grade XI teacher. Expert evaluations involved a media expert and a subject matter expert, who assessed the feasibility of the simulation-based e-module. Data collection methods included interviews with teachers, questionnaires administered to experts, and tests conducted with students.

The instruments used in this study included questionnaires and tests. The questionnaires assessed the feasibility of the simulation-based e-module and were completed by a media expert (lecturer) and a subject matter expert (teacher). The validation criteria, based on Firdaus Damayanti & Prihatina (2022), covered aspects such as design, usability, consistency, content accuracy, language clarity, presentation, and graphics. Tests were conducted as pre-tests and post-tests to measure students' communication skills before and after using the e-module, providing objective data on its effectiveness in enhancing learning outcomes.

Qualitative data analysis was conducted concurrently with data collection and after its completion, involving data reduction, data display, and conclusion drawing/verification. Data reduction included summarizing, selecting key information, and identifying themes and patterns by grouping relevant data. The qualitative data were presented in descriptive forms such as brief narratives, charts, and tables, particularly from product validation questionnaires and e-module usage assessments. Initial conclusions were considered tentative and subject to change unless supported by consistent and valid evidence collected in subsequent data gathering, ensuring credible findings. Quantitative data, primarily numerical, were analyzed using descriptive percentage analysis to evaluate product validation results and measure improvements in students' communication skills. Validation questionnaires from media and content experts employed a Likert scale, which was converted into percentages to determine minimum validation thresholds and respondent scores. Additionally, the N-Gain test was utilized to assess the effectiveness of the e-module intervention by comparing pre-test and post-test scores, indicating the extent of learning improvement among students. . In addition, the N-Gain test is used to assess the effectiveness of e-module interventions by comparing pre-test and post-test scores, showing the level of learning improvement among students. The

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N Gain formula according to Sugiono, 2020 is N-Gain = (Post-test Score - Pre-test Score) / (Maximum Score - Pre-test Score), with the following interpretation: N-Gain < 0.30 (low), 0.30 ≤ N-Gain ≤ 0.70 (moderate), and N-Gain > 0.70 (high).

Results and Discussion

Define: Analysis of Conditions and Needs

An assessment of students' learning outcomes revealed notable disparities between two classes in the Communication at the Workplace module. Class XI MP 1 achieved an average score of 85.83, while Class XI MP 2 averaged 78.67, with some students scoring as low as 60. This variation indicates an uneven grasp of communication skills among students, which may be linked to differences in resource availability and learning support.

A combined analysis of students' access to learning materials, current media use, and their needs shows a critical gap in resource adequacy and effectiveness. Only 33% of students owned handbooks, and just 30% believed the handbooks were sufficient for their learning needs. Despite 60% of students reporting exposure to e-modules, only 60% felt that these media improved their communication skills, and over half experienced difficulties understanding material through existing media. The data also indicate very low initiative to seek additional learning resources, with only 7% actively pursuing alternatives beyond school-provided materials.

This figure can be explained from two perspectives: first, the limited digital literacy of students who do not yet have the information curation skills to identify, evaluate, and utilize relevant and credible digital learning resources (Spante et al., 2018). Second, a lack of selfregulated learning skills, where students have not developed the metacognitive ability to identify their own gaps in understanding, plan compensatory learning strategies, and proactively seek additional resources without explicit guidance from teachers (Zimmerman & Schunk, 2011). This passivity reflects students' dependence on teacher-directed learning structures, which are inadequate for developing the learning independence required in the context of 21st-century education and professional work environments.

Despite these challenges, students display high motivation and interest in the subject matter and in learning through media. Ninety percent of respondents expressed a liking for the Communication at the Workplace course, while 100% showed enthusiasm for media-based learning and willingness to use electronic modules. This highlights an urgent demand for more engaging, interactive, and accessible learning tools that can support both independent and guided learning, particularly to improve practical communication competencies that current teaching methods and assessments inadequately address.

Table 1. Student Responses on Learning Resources, Media Utilization, and Interest in Communication at the Workplace

Aspect	Yes (n)	No (n)	% Yes
Students owning handbooks	10	20	33%
Handbook sufficiency	9	21	30%
Exposure to e-modules	18	12	60%
Improvement in communication	18	12	60%
Difficulty understanding media	16	14	53%
Interest in the subject	27	3	90%
Preference for media learning	30	0	100%
Willingness to use e-modules	30	0	100%

Table 1 shows limited access to adequate learning resources among students, with strong interest in using interactive media. While some have benefited from existing tools,

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overall comprehension remains uneven, reinforcing the need for more effective, engaging, and accessible learning media like e-modules.

Design Phase

This study's design phase focused on creating an interactive e-module based on real-world workplace communication, especially telephone interactions. Simulations were developed to train students in making and receiving professional calls and recording messages using standard forms such as Lembar Pesan Telepon (LPT) or block notes. Each activity was supported by clear instructions, realistic scenarios, expected outcomes, and relevant tools. The simulation emphasized not only technical skills but also communication ethics, mirroring actual industry standards.

To support this, the e-module was built on a web-based platform accessible via mobile and desktop devices. It includes structured features such as simulation response sheets and a video upload menu, allowing students to submit their work independently and enabling teachers to evaluate both written and oral performance. This dual-mode assessment encouraged students to develop both verbal and non-verbal communication skills, aligned with workplace demands.

The development process followed four key steps: (1) preparing criterion-referenced tests (pre- and post-tests), (2) selecting suitable media based on students' access to technology, (3) designing the module's visual and instructional layout, and (4) creating the initial module prototype. The format applied institutional colors, clear navigation, and was designed to be engaging yet functional for vocational high school students. A Progressive Web App (PWA) model was used for easy access without requiring installation.

As illustrated in Figure 1 and 2, the prototype displays a clean homepage with intuitive access to learning sections including tests, core content, references, tasks, and simulations. This layout is rooted in Vygotsky's scaffolding theory, progressing from guided knowledge to independent practice. Simulations were placed at the end as a culmination of students' learning, ensuring they apply concepts in realistic scenarios, thus supporting practical skill mastery and learner autonomy.

Figure 1. Main Menu of E – Module

Figure 2. Simulation Menu

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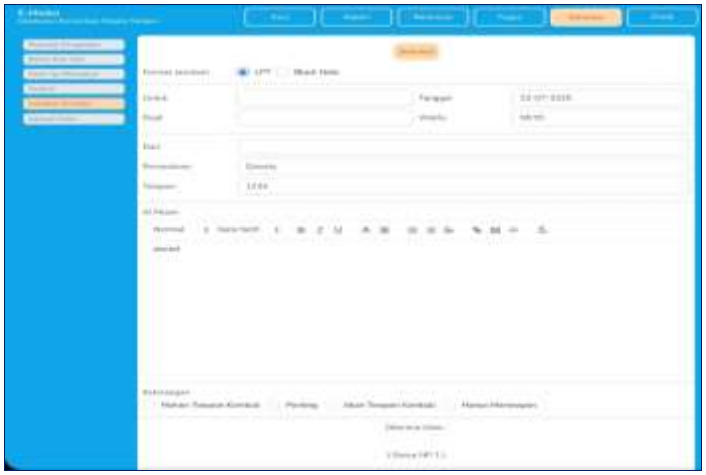

Figure 3. How to work in Simulation Menu

In developing the e-module, four essential steps were followed: (1) constructing criterion-referenced tests (pre- and post-tests), (2) selecting media appropriate to the students' technological access and learning environment, (3) defining visual and instructional format, and (4) prototyping the initial module interface. Pre- and post-tests aligned with the Indonesian SKKNI (Standar Kompetensi Kerja Nasional Indonesia) for telephone communication competencies and included both cognitive (multiple choice) and practical (oral response) components. Given students' high access to smartphones and the school's basic digital infrastructure, a mobile-friendly, web-based module was chosen. The format prioritized interactive design, visual appeal, and alignment with vocational identity by integrating institutional colors and intuitive navigation.

The structure of the module was scaffolded according to Vygotsky's constructivist principles, guiding students from conceptual knowledge (video materials and core content) toward independent application (simulation). Simulation tasks were placed at the end of the module to serve as the culmination of learning, allowing students to demonstrate applied competence. The module's layout included a homepage, pre-test, core materials, reference videos, post-test, and simulation activities. The initial prototype utilized a Progressive Web App (PWA) format, enabling seamless access across devices without installation. This design ensured learning could occur both in and out of class, accommodating student needs for flexible, accessible, and practice-oriented digital learning environments in vocational education.

Develop Phase

To ensure the content quality and media appropriateness of the developed e-module before classroom implementation, expert validation was conducted involving two subject matter experts and one media expert. The subject matter validators, both experienced in vocational education and communication studies, assessed the relevance and clarity of the module's instructional content, while the media validator reviewed technical and visual aspects. Validation was carried out using structured instruments with criteria covering content feasibility, language clarity, instructional design, and graphic presentation. These evaluations formed the basis for revision prior to the limited trial.

Table 2. Validation Results Table for Learning Materials and Media

Aspect	Indicator	Material Validator 1	Material Validator 2	Media Validator	Total Score	Eligibility Category
Content Feasibility	Breadth and relevance of material to learning objectives	3	4	-	7	Feasible

	Facts, concepts, and illustrations align with workplace communication elements	4	3	-	7	Feasible
	Material adds value and broadens student knowledge	4	3	-	7	Feasible
	Quizzes and exercises enhance communication skills	4	3	-	7	Feasible
Language Feasibility	Language is clear and easy to understand	4	3	-	7	Feasible
	Language is communicative and interactive	4	3	-	7	Feasible
Presentation	Content is systematically and logically structured	4	3	-	7	Feasible
	Learning approach is student-centered	4	4	-	8	Highly Feasible
	Module includes evaluation tools to assess communication skills	4	4	-	8	Highly Feasible
	e-Module is easy to access	4	3	-	7	Feasible
Visual Design	Combination of visuals, layout, and colors is proportional	4	4	-	8	Highly Feasible
	Font sizes are appropriate and consistent across sections	4	4	-	8	Highly Feasible
	Visual design includes a clear focal point (point center)	4	3	4	11	Highly Feasible
Design Appearance	Typography and layout are proportional	-	-	4	4	Highly Feasible
	Visual design features a strong visual center	-	-	4	4	Highly Feasible
Ease of Use	Module is easy to use and operate	-	-	4	4	Highly Feasible
Consistency	Language is consistently easy to understand	-	-	4	4	Highly Feasible
	Content is consistently structured and systematic	-	-	4	4	Highly Feasible
Usefulness	Facilitates the learning process	-	-	4	4	Highly Feasible
	Helps focus students' attention	-	-	4	4	Highly Feasible
	Easy to understand and navigate	-	-	4	4	Highly Feasible
	Total Score	52	47	32	**131**	-
	Average Score	4.0	3.6	4.0	-	-

Percentage Result	80%	78.4%	100%	-	Feasible – Highly Feasible

Based on the combined results of the expert validations, the e-module was deemed feasible and appropriate for limited implementation. The material validators rated the module at 79.2%, categorized as *"feasible"*, with strengths in content structure, language clarity, and relevance to student competencies. Meanwhile, the media validator gave a perfect score of 100%, indicating that the interface, design, and usability aspects of the e-module were *"highly feasible"*. Several constructive suggestions were made, such as fixing typographical errors, enhancing image representation, revising test items, and adding navigational guidance. Although most suggestions were implemented, the addition of audio explanations could not be realized due to technical limitations. Overall, the validation process confirmed that the e-module aligns well with instructional goals and user needs, making it suitable for further testing in the classroom.

Despite the positive evaluations, the validators suggested several improvements. These included revising unclear pretest questions, correcting visual representations that did not align with communication ethics, and enhancing the learning experience with additional guidance such as navigation instructions and audio explanations. Content-wise, validators recommended correcting minor typographical errors and improving the depth of material presentation by converting point-form content into narrative text.

Following the expert suggestions, the researcher implemented most of the recommended revisions. Pretest items were corrected, navigation instructions were added, and visual elements were refined. Additionally, content formatting was improved to enhance readability and comprehension. However, the suggested integration of audio explanations could not be implemented due to technical constraints from the developer. Nonetheless, the revised module presented a significantly improved version suitable for student use in simulation-based learning scenarios, supporting both content mastery and digital literacy.

Effectiveness Analysis

The limited trial phase was conducted to evaluate the initial effectiveness of the simulation-based e-module in improving students' workplace communication skills. Implemented on March 17, 2025, this trial involved 30 students from class XI MP 2 at SMK Teuku Umar Semarang. Students completed a pretest and post-test, and their learning outcomes were analyzed using the N-Gain formula to measure learning improvement. The results, as shown in Table 4.13, revealed an average N-Gain score of 0.751 (75.1%), which falls into the "high" category of effectiveness. These findings indicate that the e-module is capable of significantly enhancing students' understanding and readiness to engage in workplace communication practices, particularly through guided simulation tasks that mirror real-world scenarios.

Following revisions based on expert feedback, the expanded trial phase aimed to test the product's consistency and scalability. Conducted on May 6, 2025, this stage involved 60 students from two classes—XI MP 1 and XI MP 2. The results showed a consistent improvement in both groups, with XI MP 1 achieving an average N-Gain of 0.783 and XI MP 2 reaching 0.799. The overall average N-Gain across both classes was 0.791 (79.1%), indicating a high level of effectiveness. The consistency of these results confirms the stability of the e-module instructional design, in which a standardized learning structure and automatic feedback mechanism ensure an equal learning experience for all students, regardless of group characteristics. These consistent outcomes suggest that the e-module supports learning not only in small-scale settings but also when applied to larger student groups. Furthermore, the

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simulation assessments demonstrated a 10-point increase in communication skill performance in class XI MP 2, underscoring the cumulative impact of repeated and integrated use of the emodule.

The findings of this study indicate that interactive simulation-based e-learning modules produce a very high increase in learning outcomes with an average N-Gain of 0.791 (high category). These results show a significant advantage over previous studies that used conventional digital learning media. Although a study by Cahyani et al. (2020) found that STEM-integrated PjBL e-modules were quite effective in improving the creativity outcomes of vocational high school students with an N-Gain of 0.31 (medium category). In addition, another study conducted by Vianis et al. (2022) stated that the use of IT-based e-modules with the PBL model is more effective when used online, as supported by an N-Gain of 0.41 (madium category).

The development process, which included expert validation, limited and expanded trials, and iterative revisions, led to the formulation of a final simulation-based instructional model. This final model integrates the e-module as a central learning tool for teaching communication practices in vocational education settings. The positive and consistent results from both trials confirm that the e-module is not only valid in terms of content and media but also effective in improving students' applied communication competencies. Students were observed to develop both theoretical understanding and practical communication skills relevant to real workplace demands. Based on these findings, the e-module is ready for broader implementation as an effective digital learning resource for the "Workplace Communication" unit in Indonesian vocational high schools (SMKs).

Discussion

The findings of this study highlight the persistent gap between the intended learning outcomes and the current instructional practices in teaching Communication Elements in the Workplace at SMK Teuku Umar Semarang. Despite curriculum mandates emphasizing practical communication skills, the prevalent use of traditional, teacher-centered approaches results in limited opportunities for students to engage in active, experiential learning. This observation concurs with Maksum et al. (2023) and Rahma et al. (2023), who note that conventional pedagogical methods often fail to foster the soft skills necessary for professional contexts. Additionally, the minimal integration of technology beyond basic platforms like Google Drive and WhatsApp reflects an underutilization of students' digital competencies, which is a missed opportunity in supporting autonomous and interactive learning.

In response, the implementation of an e-module designed to facilitate simulation-based learning represents a strategic intervention aligned with contemporary educational theories that emphasize learner autonomy and situated learning (Nur'ainy & Sujarwo, 2025). By enabling repeated practice in realistic communication scenarios, the e-module transforms theoretical knowledge into practical skills, bridging the gap identified in previous pedagogical limitations. The inclusion of diverse features such as pre-tests, instructional content, multimedia references, and interactive simulations within the module not only supports multiple learning modalities but also enhances student engagement, a critical factor in effective skill acquisition (Ouahi et al., 2022).

The development process, anchored in the 4D instructional design model, ensured that the e-module was systematically refined through iterative validation and feedback. Expert evaluations underscored the module's strength in content accuracy, linguistic clarity, instructional design, and graphical presentation. This rigorous validation process, as recommended by Ameriza et al. (2021), guarantees that the e-module is pedagogically sound and contextually relevant. The positive shifts in validation scores after revisions further

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affirm the efficacy of iterative design and highlight the importance of expert input in instructional material development.

Empirical evidence from field testing substantiates the e-module's efficacy in enhancing students' communication competencies. The interactive simulation approach not only promoted skill mastery but also fostered greater learner confidence and motivation, which are essential for sustained skill development (Dai & Ke, 2022; Jallad, 2024). These outcomes support the premise that authentic learning experiences, characterized by interactivity and collaboration, are pivotal in vocational education, particularly in cultivating employability skills.

This study contributes to the growing body of literature advocating for technology-enhanced simulation learning in vocational settings. The e-module developed serves as a viable, flexible, and effective pedagogical tool that aligns with national curriculum directives encouraging the integration of digital resources. By addressing both cognitive and practical dimensions of communication skills, the module offers a comprehensive approach to bridging theoretical instruction and workplace readiness, underscoring the transformative potential of digital simulation in vocational education.

Conclusion

This research demonstrates that the integration of an interactive, simulation-based e-module effectively bridges the gap between theoretical instruction and practical communication requirements in vocational Office Management education. The high N-Gain scores (0.791) and expert validation (96-100%) confirm that digitizing workplace simulations through a Progressive Web App (PWA) framework significantly enhances student engagement and competency. Pedagogically, this study underscores the importance of scaffolding—moving from conceptual video-based learning to independent practical simulations—in fostering professional communication ethics.

Overall, the study confirms that integrating technology-enhanced, interactive learning tools like the e-module can transform vocational education by bridging theoretical knowledge and practical application. The positive results underscore the potential for wider adoption of such digital resources to improve employability skills among SMK graduates, contributing to reduced unemployment rates and better alignment with industry expectations in Indonesia's dynamic labor market.

Recommendation

Based on the findings of this study, it is recommended that vocational high schools, especially those in Office Management programs, integrate the developed interactive e-module into their regular teaching curriculum to enhance students' communication skills effectively. Digital simulation facilitators need to be trained to utilize this digital tool to facilitate simulation-based learning and peer collaboration, which can foster practical communication competencies aligned with workplace demands. Furthermore, educational policymakers and school administrators are encouraged to support the adoption of technology-driven learning resources and provide the necessary infrastructure to ensure all students have access to digital devices and internet connectivity. Future research could explore the long-term impact of such e-modules on students' employability and investigate their applicability across other vocational skills and disciplines to broaden the benefits of digital learning in vocational education.

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