

Transforming correspondence learning through a smart assistant system to improve student outcomes and engagement

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Article Info

Article history:

Received Aug 26, 2025

Revised Jul 13, 2026

Accepted Jul 21, 2026

Keywords:

Artificial intelligence

Correspondence learning

Higher education

Learning media development

Smart assistance

Writing skills

ABSTRACT

The insufficient feedback in business correspondence education at the higher education level necessitates innovation in adaptive and responsive learning resources. This study seeks to create and evaluate the efficacy of an artificial intelligence (AI)-driven correspondence learning assistant (CORLA) to enhance students' correspondence abilities. The study employs a research and development (R&D) methodology by utilizing the Dick and Carey model, which has ten phases of instructional development. The participants in the study were students enrolled in Digital Office Administration Study Program, Universitas Negeri Jakarta. Data were gathered by observation, interviews, questionnaires, and assessments (pre-test and post-test), and evaluated by three experts in materials, learning design, and media. The findings indicated that CORLA demonstrates a significant degree of feasibility, practicality, and efficacy. CORLA's advanced features encompass AI-driven automatic feedback, letter composition simulation, learning progress monitoring, discussion forums, and an intuitive user interface (UI). This study advances the creation of an effective and practical AI-based learning media model tailored to the requirements of teaching business correspondence abilities in higher education.

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1. INTRODUCTION

The world of education is required to continuously innovate in this era of digital transformation, particularly in integrating technology into the learning process to improve the quality of the learning outcomes for students [1], [2]. The application of artificial intelligence (AI) in the creation of educational media is one strategy that is now undergoing rapid growth [3], [4]. This technology is considered capable of delivering learning support that is personal, adaptable, and responsive to the specific requirements of each individual learner. In the context of higher education in Indonesia, particularly in vocational study programs like office administration, correspondence learning continues to encounter a variety of obstacles that have the potential to impede the accomplishment of optimal student skills [5], [6]. In the realm of work, one of the most significant forms of written communication is letter writing, specifically business letters. Office administration students are required to have a fundamental mastery of the capacity to compose business letters in line with the standards of format, structure, and formal language [7], [8]. This is a requirement for the position. Contrary to popular belief, students who participate in traditional correspondence learning are

typically only exposed to theoretical information and do not have many opportunities to engage in supervised direct practice [9].

Common issues identified include insufficient face-to-face time for writing practice, a lack of continuous practice, and a scarcity of instructors capable of delivering prompt and comprehensive feedback on student writing tasks [10]. In the increasingly popular hybrid learning system, these challenges are growing more intricate, as students must engage in independent learning without direct teacher supervision [11], [12]. Consequently, numerous students struggle to comprehend the structure of letters, employ suitable formal language, and cultivate confidence in composing official business correspondence that adheres to professional communication standards. Consequently, a new educational media solution is required to reconcile the necessity for autonomous practice with the provision of automated feedback. Numerous prior studies have investigated the application of AI in education, particularly with language acquisition and science, technology, engineering, mathematics (STEM) disciplines [13]–[15]. The findings reveal that AI-based media can boost learning motivation, hasten conceptual understanding, and offer feedback catered to personal traits. Still, little research has been done on creating AI media to complement written communication abilities in the framework of corporate communications [1], [8]. Currently, most correspondence learning tools are static, including PDF modules or learning films, devoid of interactive elements or automatic corrections [16], [17]. This reveals a discrepancy between the availability of media that could support writing practice contextually and based on feedback and the learning demands [7], [18].

This disparity highlights the need to create learning tools that not only show content digitally but also can be a partner in active learning. Direct comments on sentence structure, choice of diction, letter form, and usage of language consistent with corporate communication guidelines [19], [20], should be possible for the media in question. This study introduces correspondence learning assistant (CORLA) as a smart assistant system designed to transform correspondence learning by enhancing both student outcomes and engagement. CORLA was developed as an intelligent web-based learning media that not only provides structured resources on business letter writing—covering full block, block style, and semi-block formats—but also integrates interactive features such as writing simulations, automatic correction mechanisms, contextual feedback, and independent progress tracking. Moreover, CORLA includes collaborative elements through discussion forums and user interaction, reinforcing active and meaningful learning experiences. By embedding these intelligent features into a correspondence learning platform, CORLA demonstrates its potential to improve the quality and effectiveness of student learning significantly.

The significance of this research lies in the fact that it significantly contributes to the creation of learning media based on AI in the field of office administration. Through the provision of adaptable and responsive learning environments and the encouragement of independent learning, CORLA has the potential to become a learning model that is pertinent to the requirements of education in the 21st century. It is anticipated that CORLA will be utilized not only as a tool for the delivery of content, but also as a learning facilitator that has the potential to improve students' skill competencies significantly. The objective of this research is to create and assess CORLA learning media that is powered by AI and has the potential to enhance students' abilities to compose formal business letters. This study aims to accomplish the following objectives: i) determine the learning needs of students in the context of correspondence learning; ii) design and develop CORLA media by utilizing the Dick and Carey model; iii) validate the content of the material, learning design, and technical aspects of the media through the use of expert evaluations; iv) test the practicability of using the media through limited trials on students; and v) measure the effectiveness of CORLA media in improving student learning outcomes, both in terms of conceptual knowledge and practical skills in the area of writing business letters.

2. METHOD

Research and development (R&D) is the methodology that is utilized in this investigation, with the objective of developing a learning medium that is based on AI and is referred to as CORLA. Within the framework of higher education, this medium was designed to facilitate formal correspondence learning at the university level. This study makes use of the Dick and Carey model [21], which is a model of development that comprises ten systematic stages. These stages include the following: the identification of learning objectives, instructional analysis, analysis of learner characteristics, setting performance objectives, development of evaluation instruments, learning strategies, development and selection of materials, formative evaluation, product revision, and summative evaluation. For the duration of one semester during the academic year 2023/2024, the research was carried out at the Universitas Negeri Jakarta. The participants consisted of fourth-semester students enrolled in the Digital Office Administration Study Program, class of 2021. Participants were selected using purposive sampling based on specific inclusion criteria, including prior participation in correspondence courses, basic digital literacy, and willingness to engage with digital learning media. The needs analysis revealed that students required learning media capable of providing

immediate feedback, simplifying business letter writing across multiple formats, and supporting independent practice in hybrid learning environments. Based on these findings, CORLA was developed as an AI-assisted web-based learning medium capable of identifying structural and linguistic errors in business correspondence.

The AI feedback mechanism employed a hybrid approach combining rule-based pattern recognition and natural language processing (NLP). Rule-based algorithms were used to detect formal letter components such as heading format, salutation, body structure, closing, and signature placement, while NLP techniques were applied to analyze grammatical accuracy, formality of diction, sentence coherence, and consistency with professional correspondence conventions. The accuracy and relevance of AI-generated feedback were validated through expert review by correspondence and instructional design specialists, who compared system feedback with expert judgment to ensure instructional appropriateness. Different methods of data collection were used to thoroughly explain the media development process and outcomes. Methods of data collection applied consisted of observation carried out in class during the correspondence learning process to pinpoint issues and challenges experienced by pupils. In-depth interviews with professors, professionals, and various students to investigate particular demands the media must be able to fulfill. Surveys meant to evaluate students' opinions of the media's practicality and value following use. Distribution of this questionnaire included field trials, one-to-one evaluations, small group trials, and an expert test stage. Tests meant to gauge how well the media enhances business letter writing abilities. Before using the medium, pre-tests were done; post-tests came from students finishing their CORLA course of instruction.

The trial process was conducted in three developmental phases. A one-to-one trial was conducted with three students who independently tested the media and subsequently offered feedback on its appearance, flow, and functioning. A small group trial involving nine pupils was undertaken to evaluate practicality and navigational ease. A field test was conducted with twenty students to evaluate the media's effectiveness using a pre-test and post-test, supplemented by learning reflections and brief interviews. The selection of trial sizes followed established R&D guidelines, which recommend small samples for early formative evaluation and progressively larger samples for field testing to assess instructional effectiveness and practicality [21]. Prior to the user trial, an expert evaluation was performed, involving material specialists, instructional design authorities, and media professionals.

The indicators for material expert assessment encompass the alignment of content with relevant basic competencies, the precision of terminology, and the coherence between theory and practice within the document's structure. An example of a criterion in the material expert validation test is: "CORLA offers learning materials with sufficient depth, adhering to the established curriculum or learning objectives". The assessment indicators for instructional design expertise encompass learning strategies, alignment of the learning flow with pedagogical principles, and the efficacy of student-media interactions. An example of an indicator is: "The sequence and organization of the material are dictated by established competency standards". The evaluation criteria for media expertise encompass visual elements, navigation, readability, consistency of interface components, and system responsiveness, exemplified by the statement, "The interface of CORLA is designed to be visually appealing and to encourage active student engagement in correspondence learning". The reliability of the research instruments was examined using Cronbach's alpha. The questionnaire, which measured perceived practicality, usability, and instructional value using a five-point Likert scale, achieved a reliability coefficient of 0.89. The writing assessment test, evaluated using a rubric-based scoring system covering format accuracy, language use, and structural completeness, yielded a reliability coefficient of 0.84. These values indicate a high level of internal consistency for both instruments.

The analysis of data employed a combined quantitative and qualitative methodology. The pre-test and post-test quantitative data were examined through gain scores to assess the improvement in learning achievement. The gain score was computed using a modified formula, and the outcomes were classified into low, medium, or high categories [22]. Furthermore, to assess the significance of the disparity between the pre-test and post-test outcomes, a statistical analysis was conducted utilizing the paired sample t-test [23]. To complement significance testing and quantify the magnitude of learning gains, effect sizes were calculated using Cohen's d for paired samples, allowing for the assessment of practical significance [24]. Qualitative data obtained from observations, interviews, and open-ended student replies were examined through data reduction, data presentation, and conclusion-drawing methodologies [25].

3. RESULTS AND DISCUSSION

3.1. Results

3.1.1. Development of the correspondence learning assistant media as a smart assistant system

A systematic learning development model that was established by Dick *et al.* [21], was utilized in the process of developing the media for the CORLA. The following are the ten primary stages that make up

this model: the identification of learning objectives, the instructional analysis, the analysis of learner characteristics and context, the formulation of performance objectives, the development of evaluation instruments, the development of learning strategies, the development and selection of teaching materials, the design and implementation of formative evaluations, and the summative evaluations. The choice of this model was made to ensure that the development of media is carried out in a methodical and measurable manner, and that it can be modified depending on input received during the implementation process.

Finding the major issues in correspondence learning comes first in the development process. Most students found it difficult to grasp the structure of writing business letters, including the use of formal sentences, the placement of the proper parts of the letter, and the choice of suitable diction, based on the results of observations and first interviews with lecturers and students. Students also lacked confidence in their own writing and had restricted access to direct lecturer comments. Instructional analysis comes next, trying to map the competencies students must acquire in composing letters, including letterheads, dates, destination addresses, greetings, body of the letter, closing greetings, and signatures. Every component is then turned into a particular learning goal. Using technologies like laptops and cellphones as their main learning aids, an examination of the traits of students was also conducted in this process, most of whom were early-semester students with intermediate degrees of digital literacy.

The performance objectives are structured to enable students to create business letters in three distinct formats: full block, block style, and semi-block. An AI-based evaluation tool was developed to facilitate the attainment of this purpose by offering automatic feedback on the structure, grammar, and style of student-written letters. This AI system includes an evaluation rubric based on the rules of composing formal correspondence. The employed learning strategy prioritizes autonomous, simulation-driven, and interactive education. Students are instructed to undertake writing assignments incrementally, utilizing an AI system that offers enhancement ideas immediately within the writing interface. The educational resources are organized in a multimodal format, featuring video lessons on letter composition, exemplars of effective and ineffective letter writing, and interactive simulations enabling students to amend letters based on case studies.

During the development phase, CORLA media was constructed as a modular web-based platform. The primary features developed encompass: a letter writing practice panel, an AI-driven feedback mechanism, monitoring of student learning progress, and a discussion forum facilitating student collaboration. The AI technology employed in CORLA was built by training the model on a curated dataset of annotated business letters, enabling it to detect structural flaws, diction inconsistencies, and formatting discrepancies. Each element was built with consideration of the context of correspondence learning, which is typically individualized and task-oriented. Consequently, CORLA serves as an accessible learning companion for students, providing opportunities for practice and immediate feedback at any time.

3.1.2. Expert validation of correspondence learning assistant

The validation process is conducted rigorously by three specialists—material experts, instructional design experts, and media experts—to ensure that the developed learning media adhere to quality standards regarding content, learning design, and technical aspects. The evaluation criteria for material specialists encompass the alignment of content with relevant core competences, precision of language, and the coherence between theoretical concepts and practical application within the letter structure. According to the assessment results, CORLA effectively represents the essential components of a business letter in a manner that is comprehensible for pupils. Material specialists contribute insights to ensure that sample letters across all modules incorporate changes relevant to industry scenarios for enhanced applicability.

Experts in instructional design evaluate learning strategies, the fit of learning processes with pedagogical principles, and the success of interactions between students and media. Based on the assessment findings, CORLA has applied the learner-centered learning idea rather successfully. Though they are expected to learn on their own, students nonetheless get direction from teachers and an adaptive system. Furthermore, taking into consideration that it is capable of concurrently developing conceptual comprehension and practical abilities, the simulation-based learning approach is used. Technically, a media professional with knowledge of creating web-based user interfaces (UI) and instructional programs developed validation. Visual qualities, navigation, readability, uniformity of interface elements, and system responsiveness comprise assessment criteria. For both desktop and mobile platforms, CORLA demonstrates a neat design, intuitive navigation, and responsive interface integration that support user-friendly learning experiences. Nevertheless, the smart assistant system still requires further refinement in its AI-based feedback mechanism, particularly to ensure optimal accessibility under limited network conditions and to provide clearer visual indicators for identifying errors.

The expert validation results, summarized in Table 1, show that CORLA achieved an overall mean score of 4.79 out of a maximum score of 5, indicating a high level of feasibility. The evaluation employed a five-point Likert scale ranging from 1 (very poor) to 5 (excellent), where mean scores above 4.20 were

interpreted as “Excellent”, reflecting strong alignment with academic, instructional, and technical quality standards. This validation process serves as a critical feedback mechanism for the purpose of making decisions regarding product revisions and enhancements, in addition to serving as a final assessment. The UI, modules, and system narrative are gradually enhanced to enhance their humanistic and user-friendly qualities, and all input from the experts is analyzed and implemented. This validation process serves as a robust foundation for the limited implementation stage, which involves the evaluation of effectiveness in the context of actual learning.

Table 1. Recapitulation of expert assessments

No.	Experts	Average	Interpretation
1	Material	4.86	Excellent
2	Instructional design	4.76	Excellent
3	Media	4.75	Excellent
	Mean	4.79	Excellent

3.1.3. Practicality and effectiveness analysis

Subsequent to the expert validation phase, the CORLA media underwent a series of practicality and effectiveness assessments to ascertain its optimal usability and its tangible impact on enhancing student learning outcomes. The assessment was conducted in phases through three tiers of formative trials: individual trials, small group trials, and field trials. The individual trials encompassed three kids exemplifying diverse degrees of academic proficiency and computer competence. Students were instructed to utilize CORLA to accomplish a business letter writing assignment with system assistance, subsequently offering input on navigation convenience, instruction clarity, AI system feedback quality, and the overall learning experience. The findings indicated that the three students successfully navigated the CORLA process without encountering technological difficulties. They said that the auto-correction tool was crucial in identifying faults they had previously struggled to recognize. The system's notifications were deemed clear; nonetheless, recommendations were made to enhance the display of the warnings for improved appeal and recognition. Furthermore, they proposed using examples of diverse contextual letters to enhance the applicability of the activities.

A small group trial was subsequently undertaken with nine students. They utilized CORLA to execute a sequence of formal letter writing activities in three formats: full block, block style, and semi-block. Subsequent to the learning procedure, participants were requested to complete a practicality questionnaire and furnish open-ended responses. The testing findings indicated that CORLA achieved an average practicality score of 4.55 on a 5-point scale, categorizing it as “practical”. Students found this medium user-friendly, with an intuitive layout, and features like tutorials, exercises, and feedback systems significantly enhance their comprehension. Multiple development options surfaced, encompassing the incorporation of learning progress indicators and a “revision history” feature to enable students to monitor the evolution of their writing skills over time.

There were twenty students who participated in the field trial as end users. At this point, the efficiency of utilizing CORLA media was evaluated by means of a pre-test and a post-test (Figure 1). It was requested of the students that they compose business letters both before and after use of the media. Following the administration of the post-test, the average score improved to 87.53, which was higher than the pre-test score of 70.10, which was obtained. A gain score of 0.77, which falls into the high category, was achieved as a result of this increase. Both quantitative and qualitative data were gathered through reflective interviews, in addition to the quantitative measurements that were taken. The students reported that the use of CORLA helped them feel more confident in their writing abilities. This was attributed to the fact that the system offered direct correction and enabled them to learn from their mistakes on their own.

A paired sample t-test was conducted to examine the significance of the observed improvement. The results indicated that the t-value for the knowledge component was 6.292 and for the writing skills component was 9.943, both exceeding the critical t-value at the 5% significance level (2.093). These findings confirm statistically significant differences in students' learning outcomes before and after the implementation of CORLA. To assess the practical significance of these improvements, effect sizes were calculated using Cohen's d for paired samples. The effect size for the knowledge component was $d = 1.41$, while the effect size for writing skills was $d = 2.22$, both of which indicate a very large effect. This suggests that CORLA not only produces statistically significant gains but also has a strong practical impact on students' conceptual understanding and business letter writing skills.

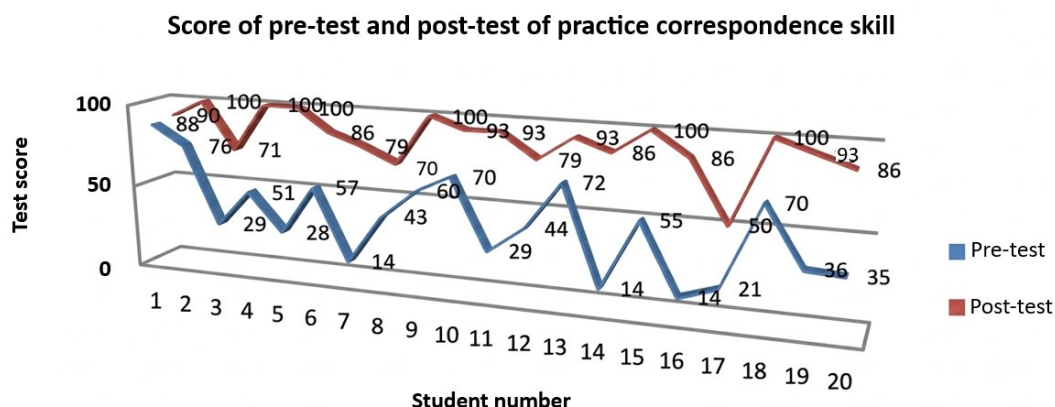


Figure 1. Comparison of pre-test and post-test in practice correspondence skills

3.2. Discussion

AI technology has great potential to transform correspondence learning, particularly in the context of higher education that implements a hybrid learning system [26], [27]. The results of the development and testing of the CORLA media show that this potential is significant. CORLA is a specific reaction to typical challenges in correspondence learning, such as restricted feedback from lecturers, inadequate planned exercises, and a lack of active student involvement in the writing learning process [9], [10]. CORLA was developed as a solution to these problems. The adaptive and interactive approach that CORLA takes is one of the most significant achievements that it has made. It is possible for this medium to provide direct feedback on problems in structure, spelling, choice of language, and the suitability of the format of the business letter. Due to this characteristic, the process of learning to write is no longer a one-way street or solely dependent on theory; rather, it is more dynamic and reflective. Students are able to acquire knowledge not only through theoretical concepts or written instructions, but also through immersive experiences that involve the AI system as a learning companion. This is consistent with the views presented in [28], [29], who highlight the significance of contextual learning and real-time feedback in the process of enhancing the quality of skills-based learning.

Within hybrid learning settings, students are often required to balance synchronous instruction with independent, asynchronous practice, which can reduce instructional scaffolding and increase cognitive load [11], [12]. CORLA's smart assistance directly addresses these challenges by functioning as an on-demand learning companion that supports students outside scheduled class sessions. The ability to access guided feedback anytime and anywhere allows students to engage in repeated writing practice without reliance on immediate lecturer supervision. This feature is particularly significant in hybrid and online learning contexts, where delayed feedback is a common barrier to skill acquisition. By integrating automated guidance into the learning platform, CORLA mitigates the fragmentation of learning experiences that frequently occurs in hybrid instructional models.

Furthermore, CORLA media uses a platform architecture that lets students learn anywhere, anytime, and on their own, therefore strengthening the student-centered learning strategy. Students are allowed to try, make mistakes, and grow straightforwardly depending on system feedback. CORLA's learning cycle matches constructivist learning's ideas, in which knowledge is developed progressively via experience and introspection [30], [31]. Not only do students absorb knowledge, but they also take front stage in the learning process. Another novel idea of CORLA is the incorporation of AI into the evolution of formal writing abilities, which, in the framework of AI, have so lately attracted little attention. Particularly as the application of AI in the development of formal written communication abilities is still somewhat rare [32], CORLA provides a special addition to the scene of educational innovation. Unlike the predominance of AI use in the STEM field and foreign language learning [13]–[15] CORLA is especially designed to understand the structure, meaning of sentences, and grammar of business letters, so enabling it to answer instructional needs that have not been widely reached by conventional digital learning media [33], [34].

The presence of CORLA enhances the execution of collaborative learning models in educational contexts. While CORLA is fundamentally intended as an autonomous learning tool, the integrated discussion tools and user forums facilitate social interaction among students. The grammar of collaborative learning, comprising the stages of engagement, exploration, transformation, presentation, and reflection, can be implemented in practice [35], [36]. Students engage in independent writing and correction, while also having the opportunity to discuss, compare outcomes, and offer feedback on their peers' work. The efficacy of

CORLA in enhancing student learning outcomes is quantitatively demonstrated by a gain score of 0.77 and the results of the paired sample t-test, which indicate a significant difference between the pre-test and post-test scores. This suggests that technology can markedly enhance learning outcomes in both cognitive and affective dimensions simultaneously [37], [38]. Students not only comprehend the composition of an effective letter but also experience enhanced confidence, independence, and active engagement in their learning process.

This finding is consistent with the findings of earlier research that highlight the significance of leveraging technology to enhance the quality of education being provided in this era of digitalization. The authors Rahiman and Kodikal [39] observed that technology-based learning, particularly adaptive learning, has the potential to enhance the levels of motivation and engagement of students, as well as the overall learning results. CORLA demonstrates that technology's applicability extends beyond mere information transfer; it serves as a mechanism for fostering personal, reflective, and transformative learning experiences. The use of technology, including AI, can be a powerful catalyst for improving the quality of learning, expanding access to meaningful feedback, and encouraging students' independence and learning empowerment in a real way, as demonstrated by this CORLA learning media [40], [41]. This is because proper learning design planning is required for the use of technology.

Despite these positive outcomes, several limitations related to the AI-based feedback mechanism should be acknowledged. At its current stage of development, CORLA's feedback system primarily focuses on structural accuracy, grammatical correctness, and formality of language, while more nuanced aspects such as semantic depth, rhetorical effectiveness, and contextual tone recognition remain limited. These constraints may affect the system's ability to fully support advanced writing proficiency, particularly for students with higher-level communication skills. Additionally, the effectiveness of AI feedback may be influenced by technical factors such as network stability, which could affect user experience and engagement in low-bandwidth environments [1], [28].

4. CONCLUSION

The AI-based correspondence learning media developed through the CORLA platform was successfully implemented using the Dick and Carey development model and demonstrated strong levels of feasibility, practicality, and effectiveness. Expert validation results indicated that CORLA achieved a very high feasibility rating, while student evaluations during individual, small group, and field trials confirmed its practicality and ease of use. The effectiveness test further showed a substantial improvement in students' formal business letter writing skills, as reflected in a significant increase in post-test scores and a high gain score. These findings indicate that CORLA not only functions as an effective instructional medium but also contributes theoretically to the integration of AI in skill-based learning by providing contextual feedback and supporting autonomous learning. Practically, CORLA offers a viable solution for addressing the challenges of hybrid learning in vocational higher education, particularly limitations in face-to-face instruction and assessment workload. However, this study is subject to several limitations, particularly the relatively small number of participants and the focus on a single institutional context, which may limit the generalizability of the findings. Nevertheless, further research is recommended to expand the implementation context, integrate CORLA with learning management systems, and explore more advanced AI features to enhance its adaptability to diverse professional communication environments.

ACKNOWLEDGMENTS

The authors thank the dean of the Faculty of Economics, Universitas Negeri Jakarta, Indonesia, for allowing the authors to be involved in the faculty research program. The authors would also like to express their gratitude to all teachers, principals, and Educational Department Officers who participated in and supported this research.

FUNDING INFORMATION

This research was funded from Faculty of Economics, Universitas Negeri Jakarta, Indonesia under grant number 923/UN39/HK.02/2023.

AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

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C : Conceptualization

M : Methodology

So : Software

Va : Validation

Fo : Formal analysis

I : Investigation

R : Resources

D : Data Curation

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E : Writing - Review & Editing

Vi : Visualization

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P : Project administration

Fu : Funding acquisition

CONFLICT OF INTEREST STATEMENT

Regarding the research, writing, and/or publication of this paper, the authors declared that there are no potential conflicts of interest that could arise.

INFORMED CONSENT

The authors have obtained informed consent from all individuals included in this study.

ETHICAL APPROVAL

The Ethical Committee of the Faculty of Economics, Universitas Negeri Jakarta, Indonesia, has granted approval for this study on 30 March 2023 (Ref. No 651/UN39.5.FE/PT.01.032023).

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author [M], upon reasonable request.

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