



Deep Learning Approach Instructional Design Textbook in the Merdeka Curriculum to Enhance Pre-Service Teachers' Teaching Readiness in Office Administration Education

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Abstract

This study aims to develop and examine the effectiveness of a Deep Learning Approach instructional design textbook in the Merdeka Curriculum to enhance pre-service teachers' teaching readiness in Office Administration Education. This research employed a Research and Development (R&D) method using the Borg and Gall model, including need analysis, planning, product development, validation, revision, and field testing. The experimental stage applied a quasi-experimental design with an experimental class using the developed textbook and a control class using conventional materials. The need analysis results indicate that students experience difficulties in understanding Learning Outcomes (LO), Learning Objectives (LOs), and the Sequence of Learning Objectives, as well as in designing assessment and instructional strategies aligned with the Merdeka Curriculum. The findings demonstrated that the textbook achieved a validity score of 78%, indicating acceptable quality for instructional use, while readability testing reached 85%, suggesting that the material was accessible and practical for students. The effectiveness test showed a statistically significant improvement after implementation ($p < 0.05$). Students in the experimental group demonstrated higher teaching readiness (85.16%, high category) than those in the control group (65.72%, moderate category). In addition, the N-Gain score of 61.79 indicated a moderate level of improvement in learning outcomes. These findings provide evidence that the developed textbook demonstrated validity, practicality, and effectiveness in supporting pre-service teachers' teaching readiness within the context of the Merdeka Curriculum.

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INTRODUCTION

Education plays a crucial role in improving the quality of human resources. In higher education, students who are prepared as future educators are required to possess strong pedagogical competence in order to design and manage effective learning processes (Merdekawaty et al., 2024). This competence becomes increasingly important with the implementation of the Merdeka Curriculum, which provides greater flexibility in developing Learning Outcomes (LO) and the Sequence of Learning Objectives. However, despite this flexibility, various challenges remain in its implementation, particularly for pre service teachers who are still in the learning phase at the university level (Hidayati et al., 2024).

The Merdeka Curriculum emphasizes critical thinking, problem solving, and creativity, which must be integrated into innovative and effective instructional strategies (Stiawan, 2024). For students in Office Administration Education, a deep understanding of instructional design and teaching strategies aligned with the Merdeka Curriculum is essential. These students are expected to become professional educators in office administration and business fields, requiring mastery of teaching methodologies relevant to current curriculum demands. However, the effectiveness of learning is highly dependent on the availability of relevant, systematic, and need-based instructional materials (Buto, 2017). Well-designed instructional materials serve as a primary guide for understanding pedagogical concepts, teaching strategies, and effective assessment practices.

In the context of the Merdeka Curriculum, instructional materials are expected not only to present theoretical knowledge but also to promote active student engagement through project-based activities, real classroom case studies, and authentic assessment aligned with real educational challenges (Nurhadi et al., 2024).

This study is grounded in Constructivist Learning Theory (Narayan et al., 2013),

a learning theory that posits that learners actively construct knowledge and make meaning, based on their experiences, individually or socially. In teacher education, constructivism emphasizes that pedagogical competence is developed not only through theoretical instruction but also through meaningful engagement with authentic teaching contexts (Taber, 2024). This perspective aligns with the principles of the Merdeka Curriculum, which encourages student-centered learning, contextual understanding, and active participation.

Therefore, the development of innovative instructional materials becomes a crucial factor in shaping adaptive and professional pre service teachers who are capable of creating meaningful learning experiences (Idul Adha & Faridi Faridi, 2024). Nevertheless, many students still face difficulties in understanding and implementing appropriate instructional strategies. These challenges are caused by limited comprehensive references on instructional design based on the Merdeka Curriculum, lack of practical experience in applying innovative teaching methods, and insufficient systematic guidance in developing instructional plans aligned with curriculum principles.

Previous studies have reported that innovative learning approaches, including Project Based Learning (PjBL) and Problem Based Learning (PBL), contribute to improving students' critical thinking, problem solving, and engagement in learning. These findings suggest that active and contextual learning experiences are important for developing higher order competencies in teacher education (Nugraha et al., 2023). However, most existing studies primarily focus on instructional implementation at the classroom level and pay limited attention to how such pedagogical principles can be systematically embedded into instructional materials that support pre-service teachers' preparation for teaching practice (Yuliani et al., 2024).

This limitation becomes relevant within the context of the Merdeka Curriculum, where pre-service teachers are expected not only to understand curriculum concepts but also to

translate them into instructional planning and classroom implementation. In response to this gap, the present study adopts a Deep Learning Approach in textbook development. Unlike approaches that emphasize isolated projects or problem-solving activities, the Deep Learning Approach integrates reflection, contextual understanding, knowledge construction, and practical application into a structured instructional resource.

In addition, authentic assessment aligned with the Merdeka Curriculum continues to be a challenge, particularly in determining appropriate evaluation methods based on competency-based learning (Aisyah et al., 2024). Furthermore, instructional materials that effectively bridge theoretical knowledge and real-world practice are still scarce, especially in vocational education contexts (Saragih et al., 2021). Although digital and interactive instructional materials have been increasingly developed (Ridwan et al., 2024), there is still a need for more innovative approaches that integrate meaningful learning experiences, case-based learning, and structured pedagogical guidance (Erika, 2019).

Based on these gaps, this study proposes the development of an instructional design textbook based on a Deep Learning Approach within the Merdeka Curriculum. The textbook is designed not only to present comprehensive concepts of Learning Outcomes and the Sequence of Learning Objectives, but also to provide practical guidance for designing instructional strategies, implementing innovative learning approaches, and conducting authentic assessments. The Deep Learning Approach is emphasized to promote meaningful learning, reflective thinking, and active student engagement. This study contributes to the field by integrating curriculum-based instructional design, innovative pedagogical strategies, and practical implementation guidance into a single comprehensive learning resource. Therefore, this research is expected to enhance pre service teachers' teaching readiness and strengthen the linkage between theoretical knowledge and practical teaching

competencies.

METHODS

This study employed a Research and Development (R&D) approach combined with a quasi-experimental design to examine the effectiveness of a Deep Learning Approach instructional design textbook in enhancing pre service teachers' teaching readiness. The R&D procedure was adapted from the Borg and Gall model (Hendarto et al., 2019), which consists of ten stages: need analysis, planning, development of the preliminary product, preliminary field testing, product revision, main field testing, operational revision, operational field testing, final product revision, and dissemination (Khotimah & Wahyu, 2020).

The experimental stage was conducted to test the effectiveness of the developed textbook. The experimental group (EG) was given special treatment using the Deep Learning Approach instructional design textbook, which integrates case-based learning, reflective activities, collaborative discussion, and the development of instructional modules based on the Merdeka Curriculum. Meanwhile, the control group (CG) used conventional instructional materials and was assigned individual tasks without structured deep learning activities. The experimental design used in this study is presented in Table 1.

The research subjects were pre-service teachers from the Office Administration Education Study Program, Faculty of Economics and Business, Universitas Negeri Semarang. The sample consisted of two parallel classes of students enrolled in the Instructional Design course and selected based on similar academic characteristics. Participant characteristics are presented in Table 2.

The participants were selected because they had completed prerequisite pedagogical courses and were entering the stage of developing instructional competencies relevant to teaching readiness.

Data were collected using both quantitative and qualitative instruments. The instru-

ments included: (1) Teaching Readiness Test, administered as pre test and post test to measure students' ability in designing, implementing, and evaluating learning based on the Merdeka Curriculum; (2) Observation, conducted during the learning process to examine student engagement, collaboration, and participation; and (3) Documentation, including students' instructional outputs such as lesson plans, teaching modules, and assessment instruments.

Table 1. Experimental Design

Group	Pre-Test	Treatment	Post-Test
EG	O1	X	O2
CG	O3	–	O4

Source: Processed Primary Data (2025)

Information:

EG: Experimental Group using the Deep Learning Approach instructional design textbook

CG: Control Group using conventional instructional materials

O1: Pre test score of experimental group

O2: Post test score of experimental group

O3: Pre test score of control group

O4: Post test score of control group

Table 2. Participant Characteristics

Variable	Category	n	Percentage (%)
Class Group	Experimental Group	39	50.0
	Control Group	39	50.0
Academic Level	Semester 5	78	100
Age	20–21 years	78	100
Gender	Male	10	12.8
	Female	68	87.2

Source: Processed Primary Data (2025)

Data analysis was conducted using quantitative and qualitative approaches. Quantitative analysis included: (1) normality

and homogeneity tests to ensure that the data met parametric assumptions; (2) paired sample t test to analyze differences between pre test and post test scores within each group; and (3) independent sample t test to compare post test scores between the experimental and control groups. In addition, the normalized gain (N Gain) score was calculated to determine the level of improvement in teaching readiness. Qualitative data from observations and documentation were analyzed descriptively to support and strengthen the quantitative findings.

RESULTS AND DISCUSSION

Result of Need Analysis

The need analysis involved 78 pre-service teachers enrolled in the Instructional Design course and interviews with course lecturers. The results indicate a substantial need for more practical instructional materials to support teaching preparation.

More than half of the students reported difficulties in understanding and applying essential concepts of the Merdeka Curriculum. Specifically, 58 students (74.4%) experienced difficulties in formulating Learning Outcomes (LO), Learning Objectives (LOs), and instructional sequences. In addition, 55 students (70.5%) reported challenges in designing appropriate assessments, while 52 students (66.7%) stated that the theoretical knowledge acquired during lectures was difficult to apply in authentic teaching situations.

Students also expressed the need for instructional materials that support practical application. A total of 63 students (80.8%) expected step-by-step guidance for instructional planning, 60 students (76.9%) requested examples of teaching modules and classroom implementation, and 57 students (73.1%) emphasized the importance of differentiated assessment and reflective learning activities.

Interview findings reinforced these results. One student explained that instructional design concepts were understood conceptually but remained difficult to implement in actual teaching practice (S03). Another student high-

lighted that contextual examples and guided exercises increased confidence in preparing instructional tools (S12).

Lecturers similarly identified a persistent gap between theory and practice. According to the interview coding, lecturers reported that students frequently reproduced existing instructional examples without adapting them to learner characteristics and instructional objectives (T01). The main weaknesses were observed in module development, assessment design, and differentiated instruction (T02).

These findings indicate that pre-service teachers require instructional materials that combine conceptual understanding with guided practical application. Therefore, the instructional design textbook was developed using a Deep Learning Approach to support meaningful learning and strengthen teaching readiness.

Planning Stage

Based on the need analysis, the textbook was designed to address the identified gap between conceptual understanding and practical application in instructional design. The development process was guided by Constructivist Learning Theory and implemented through a Deep Learning Approach, emphasizing active knowledge construction, reflection, contextual learning, and meaningful application of concepts.

The textbook design framework was structured to progressively support the development of teaching readiness. Rather than presenting curriculum concepts as isolated content, the learning materials were organized to facilitate the integration of theoretical understanding with authentic instructional practice. Learning activities included contextual cases, guided tasks, reflective questions, and practical exercises intended to encourage students to apply instructional design principles in realistic teaching situations.

The content organization covered curriculum foundations, instructional planning, learning strategies, assessment practices, and the development of instructional tools aligned

with the Merdeka Curriculum. Each component was intentionally designed to scaffold students' ability to formulate learning outcomes, develop instructional sequences, design assessments, and adapt instructional decisions to learner characteristics. Through this design, the textbook aimed to support deeper understanding and strengthen pre-service teachers' readiness for teaching practice.

Product Development

The textbook was developed through curriculum analysis, literature review, and Focus Group Discussion (FGD) findings to ensure alignment with the learning needs of pre-service teachers and the principles of the Merdeka Curriculum. The development process was guided by Constructivist Learning Theory and operationalized through a Deep Learning Approach to support meaningful and applicable learning experiences.

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Figure 1. Structure and Instructional

Components of the Deep Learning-Based Instructional Design Textbook

The development was particularly informed by recent curriculum developments in vocational education, including the updated Learning Outcomes framework established through the Decree of the Head of BSKAP Number 046/H/KR/2025 concerning Learning Outcomes for primary and secondary education. This policy requires future teachers to demonstrate not only curriculum under-

standing but also the ability to translate Learning Outcomes into instructional planning, assessment, and classroom implementation.

As illustrated in Figure 1, the textbook operationalizes the Deep Learning Approach by embedding instructional principles that promote meaningful learning, active knowledge construction, reflection, contextual problem solving, and authentic application. The textbook was intentionally designed to move beyond theoretical explanation and provide practical learning experiences that resemble instructional preparation processes in vocational schools (SMK), particularly within the Office Management and Business Services (MPLB) context.

This design is particularly intended to support students before entering the teaching practicum program in the seventh semester (LANTIP). Therefore, the textbook functions not only as a learning resource but also as a pedagogical preparation tool that strengthens pre-service teachers' readiness to teach and supports their adaptation to recent curriculum changes in vocational education.

Validation Results

The validation process was conducted using expert judgment to evaluate the appropriateness of the developed textbook before implementation. The validation involved two experts consisting of one material expert and one media expert. The material expert was a vice principal for curriculum affairs with expertise in curriculum implementation and instructional planning, while the media expert specialized in educational technology and instructional media development.

The validation instrument assessed three aspects: format, content, and sentence construction. Each indicator was evaluated using a Likert scale and converted into percentage scores. The interpretation of validation scores followed the predetermined criteria used in this study.

The overall validation score reached 78%, indicating that the textbook met the criteria for instructional use with minor revisi-

ons. The content aspect obtained the highest score (88%), suggesting that the material was relevant to instructional design competencies and aligned with the Merdeka Curriculum. The format aspect also achieved a high score (83%), indicating that the organization and presentation of learning materials supported usability.

The sentence construction aspect received a score of 67%, which indicates that revisions were required to improve sentence clarity, consistency, and readability. Validator feedback highlighted the need to simplify several explanations, improve transitions between concepts, and refine instructional wording to ensure that students could more easily follow the learning process. These revisions were implemented before the effectiveness testing stage.

Table 3. Validation Results

Aspect	Percentage	Category
Format	83%	Valid
Content	88%	Very Valid
Sentences	67%	Valid
Total	78%	Valid

Source: Processed Primary Data (2025)

Readability Testing

The readability evaluation was conducted to assess the clarity, comprehensibility, and practical usability of the developed textbook before implementation. The evaluation involved four respondents consisting of one teacher practitioner and three pre-service teachers from the Office Administration Education Study Program who represented the target users of the textbook. The readability instrument assessed three aspects: format, content presentation, and sentence construction. Responses were collected using a Likert scale and converted into percentage scores for interpretation.

The validation results produced an overall score of 78%, indicating that the textbook met the criteria for implementation with minor revisions. The content aspect obtained the

highest score (88%), indicating strong alignment between the textbook material, instructional design competencies, and the Merdeka Curriculum. The format aspect also achieved a high score (83%), suggesting that the structure and organization of the textbook supported learning implementation.

The sentence construction aspect received a score of 67%, indicating that improvements were still required to enhance clarity, consistency, and readability of explanations. Based on validator feedback, revisions focused on refining sentence structures, improving instructional wording, and strengthening coherence across learning sections.

Table 4. Readability Results

Aspect	Percentage	Category
Format	85%	Very Good
Content	90%	Very Good
Sentences	80%	Good
Total	85%	Very Good

Source: Processed Primary Data (2025)

Effectiveness Testing

Pre-Test Analysis

The equality test was conducted using an Independent Samples Test. The result shows $\text{Sig} = 0.693 > 0.05$. This means there is no significant difference between the experimental group (EG) and control group (CG). Both groups have the same initial ability. Therefore, the experimental design is valid for further testing.

Post-Test Results

After the implementation, differences in learning outcomes were observed descriptively through post-test scores. Students in the experimental group achieved a higher average post-test score ($M = 88.37$) compared with the control group ($M = 79.98$). This result indicates a tendency toward better learning outcomes among students who used the developed instructional design textbook.

Paired Sample t Test

The results show that both groups improved significantly. The significance value is $0.000 < 0.05$. This indicates a significant improvement in both groups. However, the experimental group shows higher improvement.

Table 5. Paired Sample t Test Results

Group	Mean Difference	t-value	Sig.
Control Group	22.18	16.480	0.000
Experimental Group	24.00	19.132	0.000

Source: Processed Primary Data (2025)

Learning Process

In the control group, learning was conducted individually. Students completed instructional tasks without structured guidance.

In the experimental group, students used the developed textbook. Learning activities included discussion, collaboration, and reflective tasks. Students were guided step by step in designing instructional tools.

N Gain Analysis

The effectiveness of the textbook is measured using the N Gain score. The experimental group achieved an N Gain of 61.79 (moderate category).

Table 6. N Gain Results

Category	Control (%)	Experimental (%)
High	31.58%	82.05%
Moderate	65.79%	5.13%
Low	2.63%	0.00%

Source: Processed Primary Data (2025)

This result shows that most students in the experimental group achieved high improvement.

Teaching Readiness

The teaching readiness level in the experimental group reached 85.16% (high category). The control group achieved 65.72% (moderate category). This indicates that the developed textbook improves students' readiness to teach. The findings of this study demonstrate that the developed instructional design textbook provides evidence of validity, practicality, and effectiveness in enhancing pre-service teachers' teaching readiness within the context of the Merdeka Curriculum. The need analysis results indicate that students still face significant challenges in understanding and implementing key curriculum components such as Learning Outcomes (LO), Learning Objectives (LOs), and the Sequence of Learning Objectives, particularly in translating them into instructional design and assessment practices. This finding aligns with previous studies highlighting that pre-service teachers often struggle to bridge theoretical knowledge and classroom practice due to limited exposure to contextual and practical learning resources (Baier-Mosch & Kunter, 2024; Kennedy, 2025).

The developed textbook responds to this gap by integrating a Deep Learning Approach, which emphasizes meaningful learning through active engagement, reflection, and contextual problem solving. Unlike traditional materials that focus on theoretical transmission, this textbook facilitates a more student-centered learning process. The structured organization across eight chapters, ranging from curriculum foundations to the development of instructional tools, enables students to construct knowledge progressively. The inclusion of real cases, guided exercises, and authentic assessment practices reflects recommendations from previous studies that emphasize the importance of contextual and practice-oriented learning materials in improving pedagogical competence (Li, 2025; Shi et al., 2025; Suwono & Prasetyo, 2026).

From a theoretical perspective, these findings can be interpreted through Constructivist Learning Theory, which argues that

learning becomes more meaningful when students actively construct knowledge through experience and reflection rather than passively receiving information (Bhardwaj et al., 2025; Putri et al., 2024). Within this study, the textbook operationalized this principle by requiring students to analyze curriculum documents, formulate learning objectives, design assessments, and develop instructional tools through guided and contextual activities. This mechanism may explain why students demonstrated stronger readiness to apply instructional concepts into teaching preparation (Somuah et al., 2026).

The validation results indicate that the textbook meets academic, pedagogical, and practical standards, particularly in the content aspect, which obtained the highest score. This confirms that the material is highly relevant to the needs of pre-service teachers and aligned with the Merdeka Curriculum framework. Similarly, the readability results demonstrate that the textbook is accessible and user friendly, which is essential for effective learning. These findings support earlier research stating that well-designed instructional materials can significantly enhance student engagement and understanding (Garay Abad & Hattie, 2025; Malva et al., 2026).

The expert validation and readability findings also provide insight into the mechanism through which the textbook may support learning. The high score in the content aspect suggests that curriculum alignment and instructional relevance became key strengths of the product, while readability results indicate that the structure and instructional wording were sufficiently understandable for users. These findings imply that learning materials become more effective when students are not only exposed to concepts but are also provided with scaffolding that supports gradual understanding and application (Azzaroiha et al., 2025; Nickl et al., 2024).

The experimental results further strengthen the effectiveness of the developed textbook. The pre-test analysis shows no significant difference between the experimental

group (EG) and control group (CG), indicating that both groups had equivalent initial abilities. This fulfills the assumption required for quasi-experimental research. After implementation, both groups experienced significant improvement based on paired sample t-test results. The experimental group demonstrated a slightly larger mean difference than the control group, indicating stronger learning improvement following textbook implementation.

Furthermore, the N-Gain result of 61.79 in the moderate category indicates that the textbook supported meaningful learning improvement. The distribution of gain scores also shows that most students in the experimental group achieved high improvement levels. This result suggests that the Deep Learning Approach embedded in the textbook may facilitate deeper understanding and application of instructional design concepts. This finding is consistent with studies emphasizing that meaningful learning approaches enhance higher-order thinking skills, including critical thinking, problem solving, and creativity (Khadka et al., 2025; Yang et al., 2025).

This study confirms that integrating a Deep Learning Approach into instructional materials can help reduce the gap between curriculum understanding and instructional practice in teacher education. The developed textbook not only aligns with the principles of the Merdeka Curriculum but also provides a practical framework for developing pedagogical competence. More specifically, the textbook contributes to preparing pre-service teachers to interpret recent curriculum changes and translate curriculum expectations into authentic instructional practice. Therefore, this study contributes to curriculum-based instructional design and offers contextual support for strengthening teaching readiness in teacher education programs.

CONCLUSION

The development of an instructional design textbook based on a Deep Learning Approach within the Merdeka Curriculum de-

monstrates strong validity, practicality, and effectiveness in enhancing pre service teachers' teaching readiness. The integration of structured content, contextual cases, and reflective learning activities enables students to better understand and implement key curriculum components, including Learning Outcomes (LO), Learning Objectives (LOs), and the Sequence of Learning Objectives in instructional planning. The textbook plays an important role in bridging the gap between theoretical knowledge and classroom practice.

From an educational perspective, these results imply that curriculum aligned instructional materials should not merely focus on conceptual understanding but must also incorporate authentic and practice-oriented learning experiences. For higher education institutions, especially teacher education programs, the integration of innovative and context-based textbooks becomes a strategic effort to support the effective implementation of the Merdeka Curriculum.

Another limitation of this study concerns the scope and context of implementation. Participants were limited to pre-service teachers from one study program and one institution, which may reduce broader generalizability. In addition, the study measured teaching readiness only during the learning process and did not examine whether these competencies were sustained during actual teaching practice. Future studies may extend implementation into teaching practicum settings and investigate long-term pedagogical performance outcomes.

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