From Design to Practice: Understanding by Design as a Framework for Developing Didactic Competence in Pre-Service Teachers

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ABSTRAK	ABSTRACT
Mahasiswa calon guru sering mengalami kesulitan dalam menyelaraskan tujuan pembelajaran, penilaian, dan kegiatan pembelajaran sehingga rancangan pembelajaran yang disusun cenderung tidak koheren. Penelitian kualitatif ini bertujuan untuk mengkaji peran kerangka *Understanding by Design* (UbD) dalam mendukung pengembangan kompetensi didaktik mahasiswa calon guru. Penelitian melibatkan 26 mahasiswa calon guru (14 Pendidikan Bahasa Inggris dan 12 Pendidikan Matematika) yang mengikuti Program Pendidikan Profesi Guru (PPG) tahun 2025 di Banda Aceh. Data dikumpulkan melalui analisis rancangan pembelajaran, jurnal reflektif, dan wawancara, kemudian dianalisis menggunakan *reflexive thematic analysis*. Hasil penelitian menunjukkan bahwa sebelum penerapan UbD, sebanyak 84,6% partisipan belum mampu mengaitkan tujuan pembelajaran, penilaian, dan kegiatan pembelajaran secara selaras, terutama karena penilaian masih dipahami sebatas jenis asesmen. Setelah penerapan UbD, rancangan pembelajaran menjadi lebih terarah dan selaras antara tujuan dan penilaian. Namun demikian, sebagian penilaian masih berada pada tingkat kognitif rendah dan belum mendukung keterampilan berpikir tingkat tinggi. Temuan ini menunjukkan bahwa UbD efektif sebagai *scaffold* untuk membangun kompetensi didaktik dasar, tetapi perlu didukung penguatan literasi asesmen dalam pendidikan profesi guru. **Kata Kunci**: kompetensi didaktik; keselarasan pembelajaran; perencanaan pembelajaran; mahasiswa calon guru; pemahaman melalui desain.	Pre-service teachers often struggle to align learning objectives, assessment, and instructional activities, resulting in fragmented lesson design. This qualitative study examines how the Understanding by Design (UbD) framework supports the development of didactic competence among 26 pre-service teachers (14 English and 12 Mathematics) enrolled in a 2025 professional teacher education (PPG) program in Banda Aceh, Indonesia. Data were collected through lesson plan analysis, reflective journals, and interviews, and analyzed using reflexive thematic analysis. Findings show that prior to UbD instruction, 84.6% of participants failed to coherently connect objectives, assessment, and learning activities, particularly conceptualizing assessment only in terms of types rather than evidence of learning. After applying UbD, lesson designs became more aligned, with clearer connections between goals and assessment. However, assessment tasks frequently remained at low cognitive levels, limiting opportunities for higher-order thinking. The study demonstrates that UbD effectively scaffolds foundational didactic competence by promoting alignment and reflective instructional reasoning, but does not automatically lead to higher-order assessment design. These findings highlight the importance of integrating UbD with explicit assessment literacy support in professional teacher education. **Keywords**: Didactic competence; Instructional alignment; Lesson planning; Pre-service teachers; Understanding by Design.

1. INTRODUCTION

High-quality teaching is inseparable from high-quality instructional design. Yet, lesson planning in teacher education frequently becomes a compliance-oriented activity, producing documents that follow formats, rather than a conceptual practice that integrates learning goals, assessment evidence, and purposeful learning experiences (Darling-Hammond, 2017). Recent research on pre-service teacher planning competence emphasizes that novices often struggle to structure lessons coherently, select tasks that activate learning goals, and anticipate student thinking, especially when planning is approached as "filling in" components instead of reasoning about learning (Krepf, 2023). This gap is consequential because planning competence is closely related to teachers' enactment decisions in the classroom: what teachers plan shapes what they notice, what they prioritize, and what they assess.

A central problem in pre-service lesson design is misalignment, objectives that are broad or procedural, assessments that do not produce evidence of the intended learning, and learning activities that are engaging but weakly connected to outcomes. This pattern has been repeatedly observed across teacher education contexts and is often tied to limited assessment literacy among novices (DeLuca & Bellara, 2013; Qolbi & Afriansyah, 2024). In practice, pre-service teachers may default to routine tests or activity-centered instruction, while the intended learning remains under-specified. Such a pattern is not merely technical; rather, it reflects a deeper challenge related to didactic competence, defined as the ability to make principled and goal-oriented pedagogical decisions that coherently connect curriculum, assessment, instruction, and students' learning needs (Chevallard, 2006, p. 22).

(UbD) offers a theoretically grounded alternative to "forward design" lesson planning. UbD emphasizes backward design, where teachers start by identifying desired results (including enduring understandings), then determine acceptable evidence of learning, and finally plan learning experiences and instruction (Wiggins & McTighe, 2005; Sumandya et al., 2023). UbD explicitly targets typical planning pitfalls such as treating the textbook as the curriculum and emphasizing activities without clear learning priorities (McTighe & Wiggins, 2012). Importantly, UbD conceptualizes learning as understanding and transfer, not only Understanding by Design content coverage, aligning with contemporary calls for deeper learning and competency-oriented assessment.

Recent scholarship reinforces UbD's relevance beyond curriculum documents. Studies applying backward design in teacher education report improvements in pre-service teachers' curriculum knowledge, coherence of planning, and ability to prioritize learning goals (Kerimoğlu & Altun, 2024). In applied contexts, UbD has also been used as a practical framework for aligning

outcomes and evidence in competency-based curriculum design, including in professional education settings where assessment must demonstrate performance (Newell et al., 2023). Within Indonesian contexts, research and development work has reported that UbD-informed learning programs can support conceptual mastery and problem-solving in elementary education, indicating its compatibility with local curriculum demands (e.g., IPAS learning program developed with UbD; Fradina et.al., 2022). In English language teaching, studies also highlight UbD's potential to strengthen intended learning outcomes and assessment planning, while documenting persistent difficulties in translating desired results into authentic assessment tasks (Wardana, 2024).

Despite these developments, two gaps remain salient. *First,* the empirical mechanism gap: Many studies report that UbD "helps" planning, but fewer explain *how* UbD functions as a scaffold for didactic competence—what changes in novices' reasoning, decision rules, and prioritization logic across the three stages. This mechanism is crucial because improvement is not only about producing better templates; it is about shifting pre-service teachers' professional judgment toward alignment, evidence, and transfer. *Second*, the context and cross-discipline gap: Evidence about UbD in professional teacher education in Southeast Asia—particularly in the Indonesian PPG context—remains limited, and cross-discipline examinations are rare. Pre-service mathematics and English teachers face different content structures and assessment traditions; however, both require coherent alignment of goals, evidence, and learning experiences. Examining them together provides a stronger test of UbD as a generalizable planning framework rather than a subject-specific technique. In addition to addressing these theoretical and contextual gaps, the selection of Mathematics and English is further supported by emerging contextual evidence that reinforces the relevance of focusing on these disciplines. Although this study was conducted in 2024, prior to the publication of the 2025 Academic Competency Test (Tes Kemampuan Akademik/TKA) results, the subsequent release of these findings provides important post hoc validation for the disciplinary focus adopted in this research. The TKA results revealed that student achievement in Mathematics and English remained among the lowest in Aceh Province, thereby underscoring the pedagogical urgency of strengthening instructional design and assessment practices in these subject areas (Husita, 2025). This contextual alignment further supports the examination of UbD as a cross-disciplinary framework for developing didactic competence, particularly through improved preparation of future teachers in disciplines that face persistent learning challenges.

This study addresses these gaps through a qualitative investigation of UbD-based lesson planning among 26 pre-service teachers in a 2025 PPG cohort in Banda Aceh. The study focuses on UbD as a framework for developing didactic competence, defined here as the capability to (a) prioritize meaningful learning goals, (b) design assessment evidence aligned with those goals, (c)

plan coherent learning experiences that build toward evidence of understanding, and (d) justify design decisions based on learning logic rather than procedural completion of lesson plan components.

Accordingly, the study aims to analyze how pre-service teachers demonstrate their ability to design lesson plans using the UbD framework, and examine how UbD supports the development of pre-service teachers' didactic competence. The research questions are (1) how do pre-service teachers conceptualize and apply UbD stages in instructional planning? (2) in what ways does UbD contribute to developing pre-service teachers' didactic competence (goal clarity, alignment, coherence, and assessment reasoning)?

2. METHOD

This study adopted a qualitative descriptive-interpretive design to examine how pre-service teachers enact the Understanding by Design (UbD) framework in lesson planning and how this process supports the development of their didactic competence. A qualitative approach was selected because the research questions focused on participants' reasoning, design choices, and reflections, which are best explored through rich textual evidence rather than numerical indicators (Creswell & Poth, 2018; Merriam & Tisdell, 2016). The study is positioned within an interpretive paradigm that recognizes instructional design as a meaning-making process shaped by participants' prior experiences, pedagogical beliefs, and the planning tools they employ (Patton, 2015; Miles et.al, 2014).

The study was conducted in a Pendidikan Profesi Guru (PPG) program in 2025 at a teacher education institution in Banda Aceh, Indonesia. Participants were 26 pre-service teachers who were enrolled in a module emphasizing instructional planning and assessment. The sample consisted of 14 English pre-service teachers and 12 Mathematics pre-service teachers. Participants were recruited using purposive sampling because they met the study's criteria: (1) actively completing UbD-oriented planning tasks in the PPG module and (2) producing planning artifacts suitable for document analysis (Patton, 2015). This cross-discipline composition (English and Mathematics) was intentionally retained to explore whether UbD functions as a shared design logic across subjects with different epistemic and assessment traditions. English emphasizes communicative competence, textual interpretation, and performance-based outcomes, whereas Mathematics prioritizes formal reasoning, symbolic representation, and problem-solving. This epistemic contrast provided a meaningful basis for examining whether Understanding by Design (UbD) functions as a cross-disciplinary instructional design framework rather than a subject-specific approach.

Notably, although the study was conducted in 2024, prior to the release of the 2025 TKA results, the subsequent publication of these results offers post hoc empirical support for the

relevance of this disciplinary selection. The TKA findings indicated that Mathematics and English were among the lowest-performing subject areas in Aceh Province, thereby reinforcing the pedagogical significance and contextual relevance of focusing on these two disciplines. This convergence between the study's original design rationale and later regional assessment outcomes underscores the urgency of strengthening instructional design and assessment practices in Mathematics and English, particularly within pre-service teacher education.

As part of the module, participants completed a structured assignment requiring them to design a lesson plan using UbD principles (backward design). The assignment prompt provided to the participants was:

"*Please develop a lesson plan based on your respective subject area (English or Mathematics). You may choose the topic independently. Your lesson plan must apply the principles of Understanding by Design (UbD). The plan must include assessment and evaluation aligned with the desired learning outcomes.*"

The core UbD framework and instructional scaffolding were applied uniformly to both English and Mathematics pre-service teachers to ensure comparability across disciplines. However, discipline-sensitive examples were used during discussions and analysis activities to acknowledge different epistemic traditions. For example, English-related discussions focused on performance-based assessments such as text production and oral communication, while Mathematics-related discussions emphasized problem-solving tasks and reasoning processes. No separate or differentiated intervention tracks were implemented; rather, subject-specific illustrations were used to contextualize UbD principles while maintaining a shared design framework across disciplines.

To support comparability across participants, the module emphasized UbD's three stages: Stage 1 (Desired Results): learning goals, enduring understandings, essential questions, and alignment with curriculum standards; Stage 2 (Assessment Evidence): performance tasks and other evidence aligned with Stage 1; Stage 3 (Learning Plan): learning experiences and instructional sequence aligned with Stage 1 − 2.

Data Sources and Collection Procedures

Data were collected from three qualitative sources to enable triangulation (Table 1): (1) Document corpus (UbD-based lesson plans), each participant submitted two UbD-informed lesson plan (before and after intervention). These documents served as the primary evidence for analyzing how UbD stages were enacted in practice (i.e., goal clarity, alignment, coherence, and assessment design). (2) Reflective journals, participants wrote reflective entries describing (a) difficulties encountered in each UbD stage, (b) reasons for selecting specific goals, assessments, and learning activities, and (c) perceived learning gains related to didactic competence. Reflective writing is a common qualitative technique for capturing professional reasoning and growth

trajectories in teacher education (Creswell & Poth, 2018). (3) Semi-structured interviews, a subset of participants was invited for interviews to deepen explanations of design decisions and to validate interpretations arising from document analysis. Interview prompts focused on how participants interpreted enduring understandings, constructed assessment evidence, and ensured alignment across stages.

Table 1. Data Sources and Analytic Focus

Data Source	Participants / Artifacts	Purpose	Analytic Focus
UbD-based lesson plans	26 lesson plans (14 English, 12 Mathematics)	To examine how pre-service teachers enact UbD stages in instructional planning	Stage 1 (goal clarity, enduring understandings); Stage 2 (assessment evidence, alignment); Stage 3 (instructional coherence)
Reflective journals	26 reflective narratives	To capture participants' reasoning, challenges, and perceived learning during UbD planning	Shifts in planning logic; awareness of alignment; perceived growth in didactic competence
Semi-structured interviews	Selected participants (English & Mathematics)	To deepen understanding of design decisions and validate interpretations	Justification of goals, assessment choices, and instructional sequencing

Data collection occurred after participants completed the UbD planning module and submitted final artifacts. This timing ensured that documents and reflections represented participants' best efforts after iterative feedback cycles typically present in professional teacher education.

Analytic Framework

For analytic clarity, didactic competence in this study was operationalized into four interrelated indicators derived from teacher education and instructional design literature. These indicators were used as sensitizing concepts to structure coding (Table 2) while still allowing inductive insights to emerge from the data (Merriam & Tisdell, 2016).

Table 2. Coding Scheme

Theme	Subcodes / Indicators	Operational Description
Goal clarity and prioritization	Enduring understanding; essential question; learning priority	Ability to articulate meaningful learning goals beyond content coverage
Assessment – goal alignment	Performance task; evidence of understanding; criteria	Degree to which assessment tasks capture intended learning outcomes
Instructional coherence	Sequencing; justification of activities; alignment logic	Learning activities explicitly designed to prepare students for assessment evidence

Theme	Subcodes / Indicators	Operational Description
Learner orientation	Anticipation of difficulties; scaffolding; differentiation	Consideration of students' prior knowledge and potential misconceptions
Assessment literacy challenge	Rubric vagueness; task authenticity	Difficulties specifying success criteria and designing authentic evidence

Analytic Procedure

Data were analyzed using thematic analysis (Braun & Clarke, 2006; Saldana, 2021). Coding began with sensitizing concepts derived from UbD (e.g., desired results, evidence, alignment, transfer) and didactic competence (goal clarity, assessment literacy, coherence, learner orientation). Codes were iteratively refined into themes capturing (a) how UbD was enacted in plans and (b) how UbD supported competence development. Credibility strategies included source triangulation and member checking through sharing preliminary interpretations with selected participants.

Ethical Considerations

Participation was voluntary. All data were anonymized using participant codes (e.g., E01–E14 for English; M01–M12 for Mathematics). Identifying details in documents and transcripts were removed. The study followed standard ethical practices for educational research including confidentiality, informed consent, and secure data storage.

3. RESULT AND DISCUSSION
a. Research Findings

This section presents the findings derived from document analysis of UbD-based lesson plans, reflective journals, and interviews. The results are organized to reflect changes in pre-service teachers' didactic competence before and after the UbD-based intervention, with particular emphasis on alignment between learning objectives, assessment evidence, and learning activities.

Initial Condition: Limited Alignment Between Objectives, Assessment, and Learning Activities

Analysis of the initial lesson plans revealed that the majority of pre-service teachers experienced substantial difficulties in aligning learning objectives, assessment, and instructional activities. Specifically, 84.6% of participants (22 out of 26) were unable to coherently connect these three core components of instructional design. A dominant pattern identified during first-cycle coding was assessment-as-labeling, where participants described assessment only in terms of its *type* (e.g., formative or summative) rather than as evidence of learning aligned with instructional goals. Instead of specifying what students should demonstrate to show understanding, assessments were frequently framed as classroom activities or generic tasks.

Tujuan Pembelajaran: Peserta didik mampu Menyusun teks tulis dan mempresentasikan secara lisan teks berbentuk deskriptif (descriptive) terkait topik mendeskripsikan orang lain	Learning Objectives: Students are able to compose written texts and orally present descriptive texts related to the topic of describing other people.
Asesmen	
Asesmen formatif : Guru membagikan murid ke dalam beberapa kelompok yang terdiri dari 4 orang dan membagikan LKPD ke tiap kelompok. Asesmen sumatif : mengerjakan soal	Formative assessment: The teacher divides students into groups of four and distributes worksheets to each group. Summative assessment: Students work on problems.

Figure 1. An English lesson plan

This misalignment was consistently observed across subject areas. For example, in an English lesson plan (Figure 1), the stated learning objective required students to *compose and orally present a descriptive text about a person*. However, the assessment section merely listed "formative assessment" as group work using worksheets and "summative assessment" as answering questions, without clarifying what criteria or evidence would indicate successful achievement of the learning objective.

A similar pattern was evident in mathematics lesson plans (Figure 2). Although objectives included *representing data in matrix form, understanding matrix operations, and solving matrix-related problems*, the assessment component again focused on naming assessment types rather than specifying mathematical tasks or problems that could generate evidence of conceptual understanding or problem-solving ability.

Tujuan Pembelajaran: 1. Menyatakan data dalam bentuk matriks. 2. Memahami operasi Aljabar pada matriks 3. Menyelesaikan masalah yang berkaitan dengan matriks	Learning Objectives: 1. Express data in matrix form. 2. Understand algebraic operations on matrices. 3. Solve problems related to matrices.
Asesmen	
1. Asesmen Diagnosis Awal Bagaimana suasana hati kalian di pagi hari ini? 2. Asesmen Formatif Peserta didik mengerjakan LKPD dalam diskusi kelompok Lembar observasi peserta didik selama proses diskusi berlangsung Rubrik penilaian sikap peserta didik 3. Asesmen Sumatif Soal Essay Rubrik penilaian soal	Assessment 1. Initial Diagnostic Assessment How are you feeling this morning? 2. Formative Assessment Students working on worksheets in group discussions Student observation sheets during the discussion Student attitude assessment rubric 3. Summative Assessment Essay Questions

Figure 2. A Mathematics lesson plan

From a didactic competence perspective, these findings indicate that most pre-service teachers initially conceptualized lesson planning as a procedural documentation task, rather than as a coherent design process grounded in learning goals and evidence.

Post-Intervention Condition: Improved Alignment Through UbD Framework

Following the instructional intervention in which participants studied and applied the UbD framework, notable improvements were observed in the coherence of lesson plans. Document analysis showed that most participants demonstrated clearer alignment between learning objectives and assessment, particularly in articulating what students should produce or demonstrate as evidence of learning.

More importantly, the improvement was not limited to structural alignment, but extended to how assessment instruments were constructed in relation to learning objectives. After the UbD intervention, participants began to formulate assessment tasks that directly reflected the intended competencies specified in Stage 1 (Desired Results). In contrast to the initial condition—where assessment was described merely in terms of type (e.g., formative or summative)—revised lesson plans increasingly specified concrete evidence of learning.

Figure 3. An English lesson plan (After Intervention)

For example, in the English lesson plan shown in Figure 3, the learning objectives required students to (1) determine appropriate vocabulary for describing classmates, (2) compose descriptive texts using correct linguistic elements, and (3) select appropriate descriptions. The corresponding assessment explicitly involved a written task supported by an assessment rubric. Although still categorized as formative assessment, the instrument now clearly targeted the competencies articulated in the learning objectives. This represents a significant conceptual shift:

assessment was no longer framed as a classroom procedure but as an instrument for capturing specific linguistic and communicative competencies.

A similar transformation was evident in Mathematics (Figure 4):

Figure 4. A Mathematics lesson plan (After Intervention)

The learning objectives focused on explaining the concept of matrix equality and solving related problems. In the revised lesson plan, assessment tasks included written tests and conceptual true – false items directly aligned with the stated objectives. The formulation of assessment instruments—such as items testing conditions for matrix equality—demonstrates that participants began translating abstract learning goals into measurable conceptual indicators. Compared to the pre-intervention condition, where assessment merely listed "essay questions" or "rubrics" without conceptual linkage, the post-intervention design reflects a clearer operationalization of learning objectives into assessment criteria. This change suggests that UbD's Stage 2 (Assessment Evidence) functioned as a conceptual anchor, compelling pre-service teachers to explicitly ask: *What evidence will demonstrate that students have achieved the intended understanding?* Through this backward design logic, participants appeared to internalize alignment as a planning principle rather than as a formal requirement.

Reflective journals further confirmed this developmental shift. Many participants explicitly stated that they had previously written assessment sections at the end of lesson plans without careful consideration of their relationship to objectives. After engaging with UbD, they reported intentionally designing assessment tasks immediately after defining learning goals. Interview data supported this interpretation, with several participants describing UbD as a "checking mechanism" that prevented them from disconnecting assessment from instructional purpose.

However, while the alignment between objectives and assessment instruments improved, analysis also indicates that the cognitive demand of tasks remained relatively

moderate. In English, assessments focused primarily on structured text production rather than critical or analytical language use. In Mathematics, several assessment items were procedural or true – false in format, emphasizing conceptual recall rather than extended reasoning or problem transfer. This suggests that the UbD intervention successfully strengthened instrument – objective coherence, yet additional scaffolding is required to elevate the cognitive complexity of assessment design.

Persistent Challenges: Limited Emphasis on Higher-Order Thinking

Despite the observed improvements in alignment, analysis also revealed residual challenges, particularly in the cognitive demand of assessment tasks. While assessments became more aligned with learning objectives, several lesson plans still relied on low-level tasks, such as recall questions or routine procedural exercises.

In both English and mathematics lesson plans, higher-order thinking skills—such as analysis, evaluation, or transfer—were rarely foregrounded in assessment design. For instance, English assessments often focused on surface-level text production without explicit criteria for critical language use, while mathematics assessments emphasized procedural execution rather than reasoning or problem-solving strategies.

This finding suggests that although UbD supported structural coherence and alignment, it did not automatically ensure the design of high-level assessment tasks. From a didactic competence standpoint, this indicates a partial but incomplete development: pre-service teachers improved in aligning goals and evidence, yet still required additional scaffolding to design assessments that promote deeper learning.

b.   Discussion
UbD as a Mechanism for Improving Instructional Alignment

The findings of this study indicate that the UbD framework effectively supported pre-service teachers in improving the alignment between learning objectives, assessment, and instructional activities. Prior to the UbD-based intervention, most participants conceptualized assessment in procedural terms—labeling it as formative or summative—without specifying the evidence required to demonstrate achievement of learning goals. This pattern is consistent with previous research showing that novice teachers often treat lesson planning as a documentation task rather than as a reasoning process grounded in learning purposes (Darling-Hammond, 2017; Krepf, 2023).

After engaging with UbD, participants demonstrated clearer articulation of assessment evidence that was explicitly linked to instructional goals. This shift can be explained by UbD's backward design logic, which structurally forces planners to address the question *"What counts as acceptable evidence of learning?"* before designing learning activities (Wiggins & McTighe,

2005). In this sense, UbD functions as a cognitive and didactic scaffold that externalizes alignment as a visible and non-negotiable design requirement. Similar alignment gains have been reported in studies applying backward design in teacher education and professional curriculum development contexts (Kerimoğlu & Altun, 2024; Newell et al., 2023).

From a didactic competence perspective, the improvement observed in this study reflects a transition from activity-oriented planning to evidence-oriented instructional reasoning. Pre-service teachers began to justify instructional choices in relation to intended outcomes and assessment criteria, indicating a more principled approach to lesson design. This finding supports the argument that UbD contributes not merely to better lesson plans, but to the development of professional judgment in instructional design. The use of a common UbD framework with discipline-sensitive illustrations allowed the study to examine shared patterns of didactic reasoning while respecting subject-specific assessment traditions across Mathematics and English.

Why Improved Alignment Did Not Automatically Lead to Higher-Order Thinking

Despite these positive developments, the findings also reveal that improved alignment did not consistently translate into the design of assessments targeting higher-order thinking skills (HOTS). Although assessments became more goal-aligned after the UbD intervention, many tasks remained at low cognitive levels, focusing on recall, reproduction, or routine procedures.

This limitation can be interpreted through two complementary lenses. *First*, assessment literacy among pre-service teachers remains underdeveloped, particularly with respect to designing performance tasks that elicit analysis, evaluation, or transfer. Prior studies have consistently identified assessment literacy as one of the weakest components of teacher preparation, even when teachers demonstrate adequate content knowledge (DeLuca & Bellara, 2013; Novita et.al, 2022). UbD makes the need for evidence explicit, but it does not automatically equip novice teachers with the pedagogical repertoire required to design cognitively demanding tasks.

Second, the persistence of low-level assessment tasks suggests that pre-service teachers' implicit beliefs about learning and assessment may not change as quickly as their planning structure. Research on teacher cognition indicates that novice teachers often equate "*clear assessment*" with "*easy-to-score tasks*," particularly in high-stakes or time-constrained contexts (Kunter et al., 2013). In this study, several participants expressed uncertainty about designing complex tasks and rubrics, which may have led them to default to familiar, lower-level assessments even when their goals emphasized understanding.

These findings align with previous UbD-related research showing that backward design improves coherence and alignment, but that the quality of assessment evidence depends on additional pedagogical support, such as exemplars, rubrics, and guided practice in task design

(McTighe & Wiggins, 2012; Wardana, 2024). Thus, UbD should be understood as a necessary but not sufficient condition for promoting higher-order thinking in instructional design.

UbD, Didactic Competence, and Professional Learning Trajectories

The results of this study contribute to a more nuanced understanding of didactic competence development in pre-service teachers. The observed improvements suggest that UbD supports foundational aspects of didactic competence—goal clarity, alignment, and coherence—by restructuring the logic of lesson planning. However, advancing toward higher-level didactic competence, particularly in designing HOTS-oriented assessments, requires additional layers of pedagogical scaffolding.

From a theoretical standpoint, this finding extends existing literature by highlighting that didactic competence develops incrementally. UbD appears to support an initial phase focused on structural coherence, while subsequent phases may require targeted interventions addressing task complexity, cognitive demand, and criteria-based assessment. This perspective resonates with studies in teacher education that conceptualize competence development as a progression from structural planning skills to more sophisticated pedagogical reasoning (Darling-Hammond, 2017; Krepf, 2023).

Moreover, the cross-disciplinary nature of the findings—observed in both mathematics and English lesson plans—suggests that UbD operates as a shared design language across subjects. However, subject-specific epistemic traditions still shape how HOTS is operationalized, implying that UbD-based instruction should be complemented with discipline-sensitive examples of high-level performance tasks.

Implications for Professional Teacher Education (PPG)

The findings have important implications for the design of professional teacher education programs such as PPG. First, integrating UbD into instructional planning courses can strengthen pre-service teachers' alignment competence and reflective reasoning. Second, to move beyond alignment toward HOTS, UbD instruction should be accompanied by explicit assessment design scaffolds, including: (a) annotated examples of high-level performance tasks, (b) rubrics aligned with enduring understandings, and (c) opportunities for peer critique and revision of assessment tasks.

Such an approach would position UbD not as a standalone framework, but as part of a broader pedagogical ecosystem supporting the gradual development of didactic competence.

4. CONCLUSION

This study examined how the Understanding by Design (UbD) framework supports the development of didactic competence among pre-service teachers in a professional teacher education (PPG) context. The findings demonstrate that UbD functions as an effective

pedagogical scaffold for improving instructional alignment, particularly in connecting learning objectives, assessment, and instructional activities—an area where the majority of participants initially experienced difficulty.

The study contributes theoretically by showing that UbD reshapes pre-service teachers' planning logic from a procedural, activity-centered approach toward evidence-oriented and purpose-driven instructional reasoning. By externalizing core didactic questions related to goals, evidence, and coherence, UbD makes alignment visible and subject to reflection. However, the findings also reveal that improved alignment does not automatically lead to the design of assessments targeting higher-order thinking skills (HOTS). This indicates that didactic competence develops incrementally: UbD effectively supports foundational planning competence, while more advanced competence—particularly assessment design for deeper learning—requires additional pedagogical scaffolding.

From a practical perspective, the study offers several implications for professional teacher education. *First*, UbD should be systematically integrated into instructional planning and assessment courses within PPG programs as a core design framework rather than an optional tool. *Second*, UbD-based instruction should be complemented with explicit support for assessment literacy, including exemplars of high-level performance tasks, rubric development workshops, and guided analysis of cognitive demand in assessment items. Third, opportunities for iterative feedback, peer review, and revision of UbD-based lesson plans are essential to support pre-service teachers' transition from structural alignment toward higher-order pedagogical reasoning.

Although this study was limited to a single cohort and institutional context, it provides analytic insights that are transferable to similar teacher education settings. Future research could extend this work through longitudinal designs examining how UbD-informed planning influences classroom enactment and student learning, as well as through comparative studies exploring the integration of UbD with discipline-specific pedagogies to further promote higher-order thinking.

Overall, the study positions UbD not merely as a lesson planning framework, but as a developmental tool for cultivating didactic competence in pre-service teachers—bridging the gap between instructional design and professional teaching practice.

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