Development and Validation of an Affective Domain Instrument for Pre-Service Non-Technical Teachers: Assessing Opinions, Beliefs, and Assessments of Worth at UNIMED's Faculty of Engineering

Sumarno[1], Selamat Riadi[2], Nur Basuki[3], Zulkifli Matondang[4]

(sumarno@unimed.ac.id[1], selamatriadi@unimed.ac.id[2], nurbasuki@unimed.ac.id[3], zulmato@unimedac.id[4])

Mechanical Engineering Education, Engineering Faculty of Unimed[1,2,3] Building Engineering Education, Engineering Faculty of Unimed[4]

Abstract. This study aimed to develop and validate an affective domain instrument designed to assess pre-service non-technical teachers' dispositions toward the teaching profession at UNIMED's Faculty of Engineering, Indonesia. The instrument was constructed around three affective constructs: opinions, beliefs, and assessments of worth, and each measured across five affective hierarchical levels. The instrument was trialed with 247 pre-service non-technical teacher education students. Data were analyzed using confirmatory factor analysis (CFA), Pearson product-moment correlations, composite reliability (CR), and Cronbach's alpha. The findings confirmed that 19 of 25 items for opinions, 21 of 25 items for beliefs, and 20 of 25 items for assessments of worth were valid. Reliability coefficients were consistently high (CR = 0.94–0.96; Cronbach's alpha = 0.80–0.83), exceeding the recommended threshold of 0.70. Theoretically, the study demonstrates that affective dispositions, often considered intangible, can be rigorously operationalized and measured in teacher education. Practically, the validated instrument provides a diagnostic tool to strengthen professional identity formation and value alignment among pre-service teachers, with implications not only for Indonesia but also for global efforts to integrate affective assessment into teacher education.

Keywords: Affective Domains, Pre-Service Teachers, Instrument Validation

1. Introduction

The affective domain has long been recognized as a foundational pillar of educational objectives, complementing the cognitive and psychomotor domains [1] [2]. Its significance in teacher education has gained renewed scholarly attention—highlighting how values, attitudes, and dispositions shape professional identity, ethical judgment, and long-term commitment to the teaching profession [3] [4] [5]. Despite this theoretical consensus, pre-service teacher education continues to prioritize cognitive achievement, while assessment of affective learning outcomes remains sporadic and underdeveloped [6].

Recent efforts to develop and validate affective instruments have emerged across diverse educational contexts, such as online learning environments [7], diagnostic instruments for teacher emotions [8], as well as K–12 and science education settings [9] [10]. Yet, these

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instruments are often context-specific and lack robust validation across culturally varied or professional educational contexts. In particular, instruments targeting pre-service teacher affective dispositions—such as beliefs in professional efficacy, opinions about teaching, and assessments of career worth—remain underrepresented in the literature [11].

This gap is especially salient in the context of vocational teacher preparation at Indonesia's Universitas Negeri Medan (UNIMED), Faculty of Engineering, where pre-service teachers in technical (e.g., Mechanical, Informatics, and Electrical Education) and non-technical (e.g., Culinary Arts, Fashion Design, and Beauty Education) programs study alongside non-education peers. This diversity presents both complexity and opportunity: an affective instrument in this context must be sensitive to varied disciplinary orientations while maintaining strong psychometric validity.

Furthermore, validation should not be viewed as purely statistical; according to Messick (1995), validity integrates content, construct, and consequential evidence[12]. Contemporary validation models recommend combining expert review, exploratory and confirmatory factor analyses (CFA), and reliability indices like Cronbach's alpha or composite reliability to ensure construct fidelity [13].

To address these needs, the present study aims to develop and validate an affective domain instrument specifically for pre-service non-technical teachers at UNIMED's Faculty of Engineering. The instrument incorporates three theoretically grounded constructs—opinions, beliefs, and assessments of worth—and will undergo expert validation, exploratory and confirmatory factor analyses, and reliability testing. This work aims not only to fill a methodological gap but also to contribute a psychometrically sound tool for enhancing affective learning assessment in vocational teacher education.

2. Literature review

2.1 The Affective Domain in Education

The affective domain has long been acknowledged as integral to educational objectives, complementing the cognitive and psychomotor domains [1], [2]. In teacher education, it has been positioned as central to shaping professional identity, ethical decision-making, and student engagement [4]. Miller (2005) also argued that affective learning underpins authentic engagement, without which knowledge and skills remain superficial [14]. While these foundational works established the theoretical necessity of affective learning, more recent scholars emphasize its practical implications for sustaining teachers' career commitment [5]. This trajectory illustrates a shift: from early conceptual recognition of affective learning to contemporary demands for operationalization and measurement in real educational contexts.

2.2 Core Constructs: Opinions, Beliefs, and Assessments of Worth

Scholars have conceptualized affective dispositions in teacher education through three interrelated constructs: opinions, beliefs, and assessments of worth. Opinion**s** are often described as evaluative judgments that capture immediate attitudes toward the teaching profession[15]. By contrast, belief**s** are more stable convictions, often linked to motivational frameworks such as expectancy–value theory, which argues that individuals' task choices depend on their perceived competence and the value assigned to the task [16]. Assessments of worth, as elaborated in the FIT-Choice model, reflect broader evaluations of the desirability and

prestige of teaching as a career, which are critical predictors of long-term career persistence [11].

Comparative analyses suggest important distinctions. Allen and Friedman (2010) treat opinions as flexible and context-dependent, whereas beliefs are more resistant to change, anchoring professional identity[15]. Eccles and Wigfield (2002) extend this by embedding beliefs within motivational structures, showing that they not only reflect conviction but also drive action [17]. Watt and Richardson (2007), meanwhile, highlight that assessments of worth capture the external and intrinsic valuations that sustain teaching as a career choice [11]. Taken together, these perspectives suggest a hierarchical layering: opinions function as surface-level evaluative expressions, beliefs anchor enduring motivational patterns, and assessments of worth provide broader career-related justification.Empirical evidence supports this hierarchy. T. Xie, L. Zhang, and G. Liu (2022) found that while opinions about teaching may fluctuate during training, beliefs in teaching efficacy were more consistent predictors of persistence [5]. Similarly, Watt and Richardson (2007) showed that high assessments of worth correlate with stronger resilience and retention in teacher preparation [11]. However, most instruments to date have tended to operationalize these constructs in isolation—focusing on teaching efficacy beliefs (e.g., Tschannen-Moran & Hoy, 2001) or career value assessments (FIT-Choice)—with few attempts to integrate opinions, beliefs, and assessments of worth into a unified framework [18]. This fragmentation limits a holistic understanding of pre-service teachers' affective dispositions. Addressing this gap is essential for building instruments that reflect the layered and interconnected nature of affective constructs in teacher education.

2.3 Instrument Development and Validation in the Affective Domain

Various instruments have been developed to capture affective constructs in specific domains. Theresia, A. Saptono, and A. Pratama (2021) introduced an affective assessment model in entrepreneurship education [19], while C. M. Callahan *et a* (2020) validated an affective engagement scale in science learning [9]. Siu et al. (2024) developed the ASOLS for online learners [7], and Leung (2024) created the Teacher Emotions Scale [8]. Although these instruments highlight innovation, their applicability is narrow: each responds to a particular educational niche. For example, ASOLS effectively addresses online learning, but lacks transferability to vocational teacher contexts. Similarly, the Teacher Emotions Scale highlights affective processes in classroom teaching, yet focuses more on emotions than on professional dispositions such as beliefs or value assessments. This comparison shows that while affective constructs are measurable, existing tools are fragmented, context-bound, and rarely validated across diverse cultural or professional teacher education settings.

2.4 Validation Frameworks and Psychometric Standards

Validation frameworks emphasize that psychometric rigor involves more than statistical reliability. Messick (1995) proposed an integrative perspective where content, construct, and consequential validity converge[12]. Recent works highlight the importance of confirmatory factor analysis (CFA) to establish structural validity [13], and reliability indices such as Cronbach's alpha or composite reliability to confirm consistency. Dorji and Yangzom (2021) further argued that affective assessment remains underdeveloped in higher education because instruments often rely on face validity alone, ignoring deeper construct validation. When viewed together, these studies underscore that psychometric robustness is uneven across contexts: while some instruments meet statistical requirements, few integrate multiple sources

of validity evidence [6]. This creates a risk of instruments producing misleading conclusions about affective dispositions, particularly in cross-cultural or vocational settings.

2.5 Contextualizing Affective Assessment in Teacher Education

Within teacher education, affective dispositions are decisive for career choice and persistence. Watt and Richardson (2007) demonstrated that positive beliefs about teaching efficacy correlate with stronger career motivation [11], while T. Xie, L. Zhang, and G. Liu (2022) highlighted the role of affective dispositions in building resilience during pre-service training [5]. However, these findings are drawn largely from Western or K–12 contexts. In non-Western contexts such as Indonesia, studies remain scarce, despite the diversity and complexity of teacher education systems. At Universitas Negeri Medan's Faculty of Engineering, for example, teacher education coexists with non-education programs, creating a heterogeneous environment. This unique context demands an instrument capable of capturing affective dispositions across technical and non-technical programs. Synthesizing across the literature, it is clear that research has demonstrated the importance of affective dispositions, developed fragmented instruments, but has yet to validate an integrated, culturally grounded tool in vocational teacher education. Addressing this gap represents both a methodological and practical contribution to the field.

3. Methodology

3.1 Research Design

This study employed a research and development (R&D) design with a focus on instrument validation in accordance with established psychometric standards [12], [13]. The validation process was guided by both content-oriented approaches (expert review, theoretical alignment) and construct-oriented approaches confirmatory factor analysis (CFA). The design was cross-sectional, with data collected from pre-service non-technical teachers enrolled at Universitas Negeri Medan's Faculty of Engineering.

3.2 Participants

The population comprised undergraduate students from vocational teacher education programs at UNIMED's Faculty of Engineering. The sample included pre-service non-technical teachers enrolled in Culinary Arts, Fashion Design, and Beauty Education programs, stratified by semester levels (II, IV, VI, VIII, X, and XII). A stratified proportional random sampling technique was employed to ensure representation across study programs and semester strata.

The sample size was determined in accordance with factor analysis guidelines, which recommend a minimum of 5–10 participants per item [20], [13]. A power analysis conducted using G*Power 3.1 confirmed that the selected sample size ($N \approx 231$) provided sufficient statistical power (0.90) to detect a medium effect size in confirmatory factor analysis (CFA). In this study, the final sample included 247 students.

3.3 Instrument Development

The instrument was designed to capture three affective constructs identified in the literature: opinions, beliefs, and assessments of worth [17], [11], and [15]. Item generation followed a deductive approach, drawing upon established taxonomies of the affective domain [2] and contemporary motivational models (expectancy–value theory).

Items were developed in Likert-scale format (1 = strongly disagree to 5 = strongly agree). Expert review involving three senior scholars in teacher education and two psychometricians evaluated the instrument's content validity, clarity, and cultural appropriateness. Revisions were made based on expert feedback, resulting in a final pilot version of 25 items for each aspect.

3.3.1 The Construct of Opinions

The construct of *opinions* was grounded in multiple theoretical perspectives. Eagly and Chaiken defined opinions as evaluative expressions of attitudes, emphasizing their role as outward manifestations of internal states [21]. Rosenberg and Hovland located opinions within the cognitive–affective component of attitudes, showing their dual basis in thought and emotion [22]. D. R. Krathwohl, B. S. Bloom, and B. B. Masia treated opinions as indicators of value development in the affective domain, progressing through receiving, responding, and valuing [2]. Ajzen incorporated opinions into the theory of planned behavior**,** suggesting that they are shaped by behavioral beliefs and, in turn, influence behavioral intentions [16]. Finally, Allen and Friedman conceptualized opinions as affective statements that reflect individuals' value engagement with professional roles [15].

Synthesizing these perspectives, *opinions* in the context of pre-service teacher education can be defined as students' evaluative expressions regarding the teaching profession, encompassing its meaning, required competence, personal relevance, ideological alignment, and broader social reality. Opinions are dynamic, influenced by experiences and social context, and serve as a bridge between beliefs (stable convictions) and assessments of worth (value judgments)**.**

Based on this synthesis, opinions were operationalized into five dimensions: (1) Meaning of the Profession – how teaching is understood as a profession of intrinsic value and significance. (2) Competence and Impact – evaluations of the competencies required for teaching and their potential influence on learners and society. (3) Personal Alignment (Preferential) – the extent to which teaching aligns with personal aspirations and career preferences. (4) Ideological Values – the degree to which teaching reflects broader values such as service, equity, and social contribution. (5) Social Reality of the Teaching Profession – perceptions of teaching in terms of societal recognition, professional challenges, and social status.

3.3.2 The Construct of Beliefs

The construct of *beliefs* has been extensively studied in psychology and education. Pajares [23] defined beliefs as psychologically held understandings that individuals accept as true, shaping how they interpret experiences. Bandura [24] emphasized the importance of self-efficacy beliefs, noting that teachers' judgments about their own abilities strongly predict effort and persistence [24]. Eccles and Wigfield (2002), through expectancy–value theory, argued that beliefs about competence and task value are central in shaping motivation and career choice [17]. Richardson (1996) described beliefs as relatively stable yet revisable with new professional experiences. Allen and Friedman (2010) also viewed beliefs as affective anchors that connect personal convictions with professional values [15].

Synthesizing these perspectives, *beliefs* in the context of pre-service teacher education can be defined as students' relatively stable convictions about the meaning, competence, welfare, identity, and challenges of the teaching profession**.** Unlike opinions, which are more dynamic and context-driven, beliefs are more enduring and form the backbone of professional identity.

Based on this synthesis, beliefs were operationalized into five dimensions five dimensions: (1) Meaning of the Profession – convictions about the intrinsic meaning and significance of teaching as a profession. (2) Competence and Impact – convictions about the necessity of pedagogical competence and its impact on learners and society. (3) Welfare and Status –

convictions about the material welfare and social status attached to the teaching profession. (4) Devotion and Identity – convictions about teaching as a moral calling and central to one's professional identity. (5) Professional Challenges and Realities – convictions about the difficulties, workloads, and social realities inherent in teaching.

3.3.3 The Construct of Assessments of Worth

Assessments of worth reflect broader judgments about the value and desirability of teaching as a career**.** Eccles and Wigfield [17] emphasized that value-related beliefs—intrinsic, utility, attainment, and cost—are central determinants of educational and career decisions, forming the backbone of expectancy–value theory. Watt and Richardson [11], through the FIT-Choice model, confirmed that assessments of worth strongly influence teaching motivation, career selection, and long-term retention. Building on this theoretical foundation, Wigfield, Tonks, and Klauda [25] highlighted that subjective task values not only predict persistence but also interact with contextual factors to sustain professional commitment. More recently, T. Xie, L. Zhang, and G. Liu [5] provided empirical evidence that high ratings of teaching worth enhance pre-service teachers' resilience and persistence in completing their training. Complementary studies further demonstrate the applicability of expectancy–value models in diverse educational settings, underscoring their explanatory power in linking affective dispositions with occupational persistence [26]. Together, these studies underscore that assessments of worth are not peripheral but foundational constructs in understanding teacher motivation and professional identity.

Synthesizing these perspectives, *assessments of worth* can be defined as students' evaluative judgments of the personal, social, economic, ideological, and sustainability-related value of teaching as a profession. Unlike opinions (which are situational) and beliefs (which are convictions), assessments of worth represent broader evaluative judgments that integrate personal meaning with societal and career considerations.

Based on this synthesis, assessments of worth were operationalized into five dimensions five dimensions: (1) Personal Worth – judgments of teaching as meaningful, fulfilling, and self-enhancing. (2) Social Worth – judgments of teaching's contribution to community life, recognition, and social value. (3) Economic and Career Worth – judgments of teaching in terms of salary, welfare, job security, and career mobility. (4) Ideological and Moral Worth – judgments of teaching as a moral duty, ideological contribution, or act of service. (5) Challenges and Sustainability – judgments of teaching concerning professional demands, sustainability, and long-term viability.

3.4 Validation Procedures

The validation process followed three stages:

1. Content Validation: Experts assessed item relevance and alignment with the three domains (opinions, beliefs, and assessmenet of worth).
2. Confirmatory Factor Analysis (CFA**)**: was conducted on the sample (n = 247) to test the five-factor model derived from the theory of each domain. Model fit was evaluated using factor loadings ≥ 0.35 (Hair et al, [13]).
3. Reliability Analysis: Internal consistency was evaluated using Cronbach's alpha (≥ .70) and composite reliability.

3.5 Data Analysis

In this study, the construct's validity was examined using confirmatory factor analysis (CFA) with the help of the Lisrel 8.30 software, and Pearson's product-moment correlation with the help of Excel software. According to Hair et al. (1998: 112), researchers can determine statistical power to assess the significance of factor loadings based on sample size [13]. For this study, the aim was to obtain a power level of 80% using a significance level of $\alpha = 0.05$. Items with validity coefficients of ≤ 0.32 were deemed inadequate and discarded.

When testing the validity of the developed items using Pearson's correlation, the results of the calculation are compared with the Product Moment Correlation Table, taking into account the number of research samples (247 people). Items are declared valid if the result of the Pearson's correlation calculation is greater than 0.125. The analysis aimed to confirm whether the proposed three-construct model (opinions, beliefs, assessments of worth) demonstrated satisfactory validity and reliability. Findings from CFA would provide evidence of construct validity, while internal consistency measures would confirm reliability.

The reliability was examined using the Cronbach's Alpha equation and composite reliability for each latent variable. For the composite reliability analysis, indicator loading data and error variance obtained from the completely standardized solution section of the CFA analysis were used, which were then entered into the following composite reliability formula.

4. Research Results

4.1 Validity and Reliability of the Opinions Instrument

Confirmatory Factor Analysis (CFA) of the opinions construct, which comprised 25 items, revealed that six items (items 4, 5, 10, 15, 20, and 25) had factor loadings below the recommended threshold of 0.32, while items 5 and 20 also showed t-values less than 1.96. Pearson’s correlation further identified two items (items 4 and 20) as invalid. Integrating both analyses, six items were considered invalid, leaving 19 valid items for further analysis.

Reliability testing demonstrated strong consistency. The combined reliability index for all dimensions of the opinions construct reached 0.94, while Cronbach’s alpha was 0.80, exceeding the recommended 0.70 threshold. This indicates that the opinions instrument is internally consistent and capable of measuring affective dimensions reliably.

4.2 Validity and Reliability of the Beliefs Instrument

The CFA results for the beliefs construct showed that four items (items 5, 10, 15, and 25) had factor loadings below 0.32, and two items (items 5 and 15) displayed t-values less than 1.96. Pearson’s correlation analysis identified three invalid items (items 5, 10, and 15). Thus, four items were removed, and 21 items were retained as valid.

The reliability indices confirmed the robustness of the beliefs instrument. The combined reliability across dimensions reached 0.96, and Cronbach’s alpha was 0.81, surpassing the minimum requirement for educational instruments. These results confirm that the beliefs construct is measured consistently and with high accuracy.

4.3 Validity and Reliability of the Assessments of Worth Instrument

CFA of the assessments of worth construct identified five items (items 5, 10, 15, 20, and 25) with low factor loadings (<0.32) and non-significant t-values, indicating invalidity.

Pearson's correlation, however, showed that all items met the minimum threshold. To maintain psychometric rigor, the five problematic items were removed, resulting in 20 valid items.

Reliability testing revealed that the combined reliability for the assessments of worth construct reached 0.96, while Cronbach's alpha was 0.83. Both indices confirmed excellent reliability, supporting the use of this instrument to capture pre-service teachers' evaluative judgments regarding the worth of the teaching profession.

Table 1. Summary of Validity and Reliability of Affective Domain Instrument

Construct	Initial Items	Valid Items	Invalid Items (CFA)	Composite Reliability (CR)	Cronbach's Alpha
Opinions	25	19	4, 5, 10, 15, 20, 25	0.94	0.80
Beliefs	25	21	5, 10, 15, 25	0.96	0.81
Assessments of Worth	25	20	5, 10, 15, 20, 25	0.96	0.83

5. Discussion

The validation of the affective domain instrument provides strong evidence of its psychometric soundness for assessing pre-service non-technical teachers' affective dispositions at UNIMED. The results confirm the multidimensional structure of the instrument, encompassing opinions, beliefs, and assessments of worth, each of which demonstrated acceptable validity and high reliability.

5.1 Construct Validity and Item Refinement

The CFA identified problematic items across the three constructs, particularly in the lower-order dimensions of organizing and characterization. This finding is consistent with prior research suggesting that affective constructs are complex and context-dependent, often leading to weaker item performance in advanced hierarchical levels [2], [15]. The decision to remove these items strengthens the construct validity by retaining only items with satisfactory loadings and significance.

5.2 Reliability and Internal Consistency

The Cronbach's alpha values (>0.80) and combined reliability indices (>0.94) across all constructs exceed the recommended thresholds for internal consistency as outlined in psychometric standards (e.g., Hair, Black, Babin, & Anderson, [13]). Such coefficients indicate excellent reliability and surpass the commonly accepted benchmark of 0.70, affirming that the instrument measures its constructs consistently. These findings align with previous validation studies in affective learning [7], supporting the reliability of affective measures across diverse educational contexts.

5.3 Implications for Teacher Education

The validated instrument has significant implications for vocational teacher education. First, it provides a standardized tool for assessing affective dispositions—an often-neglected dimension of teacher preparation programs. Second, by distinguishing between opinions, beliefs, and value assessments, the instrument enables nuanced diagnosis of students'

professional orientations. This diagnostic potential is critical for designing interventions that strengthen affective commitments, professional identity, and resilience among pre-service teachers [4], [11].

5.4 Practical Contributions

Beyond theoretical and methodological contributions, the instrument offers practical applications in teacher education and educational policy:

1. Curriculum Development – By systematically measuring affective dispositions, educators can identify affective gaps and design curricula that integrate affective objectives alongside cognitive and psychomotor competencies.
2. Program Evaluation – Institutions can use the instrument as an evaluative tool to monitor the affective growth of pre-service teachers across cohorts, thereby informing accreditation processes and quality assurance mechanisms.
3. Professional Guidance and Mentoring – The instrument can serve as a diagnostic resource for academic advisors and mentors to support students' professional identity formation, resilience, and commitment to teaching.
4. Policy and Strategic Planning – Policymakers can utilize the data generated from this instrument to align teacher education policies with the broader goals of holistic and competency-based education reforms.

5.5 Limitations and Future Research

Although the instrument demonstrated strong psychometric properties, several limitations warrant attention. The sample was drawn exclusively from three non-technical programs at UNIMED, which may limit the generalizability of findings. Future research should extend validation efforts across technical teacher education programs and other institutions to ensure broader applicability. Furthermore, advanced techniques such as the Heterotrait–Monotrait ratio (HTMT) could complement Fornell–Larcker analysis to further establish discriminant validity [27] [28].

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