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Operationalizing Conscious Adaptive Teaching: Development and Initial Validation of the Conscious Adaptive Teaching Scale (CATS)

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Abstract: **The increasing complexity of higher education requires faculty to adapt instruction to learner diversity, technological innovation, and evolving educational contexts. However, existing measures do not adequately capture the consciously regulated processes underlying adaptive instructional decision-making. This study developed and provided initial psychometric validation of the Conscious Adaptive Teaching Scale (CATS), grounded in the Conscious Adaptive Teaching framework. Instrument development included construct specification, deductive item generation, expert content validation, pilot testing, and psychometric evaluation. Content validation demonstrated strong item relevance and agreement (I-CVI = .86–1.00; S-CVI/Ave = .96; modified κ = .84–1.00). The final 35-item CATS was administered to 350 higher education faculty members. Exploratory factor analysis supported five dimensions: Instructional Awareness, Pedagogical Judgment, Adaptive Responsiveness, Inclusive Facilitation, and Reflective Enhancement, with the first five initial eigenvalues accounting for approximately 57.02% of total variance. Confirmatory factor analysis provided initial support for the five-factor measurement structure, while higher-order CFA indicated that the five dimensions loaded positively on an overarching Conscious Adaptive Teaching construct (β = .499–.691). Composite reliability was strong across dimensions (CR = .857–.884). Convergent-validity evidence was generally supportive but mixed: AVE ranged from .464 to .522, with three dimensions meeting the conventional .50 criterion and Instructional Awareness and Adaptive Responsiveness falling slightly below it. Discriminant validity was supported by the Fornell–Larcker criterion and HTMT values (.262–.455). Internal consistency was strong across dimensions (α = .857–.884), with overall CATS reliability of α = .915 and ω = .914. Collectively, the findings provide promising initial psychometric evidence for the CATS as a multidimensional measure of Conscious Adaptive Teaching. Independent replication, temporal-stability assessment, and further validity testing are warranted.**

Keywords: **Conscious Adaptive Teaching; adaptive teaching; teacher cognition; scale development; psychometric validation; higher education.**

I. INTRODUCTION

Higher education is undergoing rapid transformation driven by increasing learner diversity, technological innovation, artificial intelligence (AI)-supported learning, and growing expectations for student success. These changes require faculty to move beyond routine instructional practices and make continuous instructional decisions that respond to evolving learner needs and educational contexts. Consequently, adaptive teaching has become a defining characteristic of effective instruction, requiring educators to modify teaching strategies, learning activities, assessment, and feedback while maintaining alignment with intended learning outcomes (Chen et al., 2024; Shi & Liu, 2025; Zhang et al., 2025).

Although adaptive teaching is widely recognized as essential to instructional effectiveness, existing research has focused primarily on observable teaching behaviors, instructional flexibility, and professional competencies. Comparatively little attention has been given to the conscious cognitive processes that precede adaptive instructional decisions, including how educators interpret instructional complexity, evaluate pedagogical alternatives, regulate instructional responses, and reflect on instructional outcomes. As a result, current theories explain what adaptive teachers do but provide limited insight into how consciously regulated instructional decisions are formed. This theoretical gap is reflected in the measurement literature. Existing instruments assess related constructs such as differentiated instruction, instructional quality, reflective practice, assessment literacy, digital competence, and teaching effectiveness. While these measures evaluate important aspects of instructional practice, they primarily assess observable behaviors or professional competencies rather than the cognitive processes underlying adaptive instructional decision-making. Consequently, the review identified no existing instrument that integrates Conscious Adaptive Teaching as a multidimensional construct encompassing instructional awareness, pedagogical judgment, adaptive responsiveness, inclusive facilitation, and reflective enhancement.

To address this gap, Bull (2026) proposed the Conscious Adaptive Teaching (CAT) Framework, which conceptualizes adaptive teaching as the product of consciously regulated instructional decision-making. However, empirical evaluation of the framework has been limited by the absence of a valid and reliable measurement instrument. Accordingly, the purpose of this study was to develop and provide initial psychometric validation of the Conscious Adaptive Teaching Scale (CATS), a multidimensional instrument designed to operationalize Conscious Adaptive Teaching and support future research examining adaptive instructional decision-making, faculty effectiveness, and student learning outcomes.

The purpose of this study was to develop and evaluate the psychometric properties of the newly developed Conscious Adaptive Teaching Scale (CATS) by examining its latent factor structure, construct validity, and reliability among higher education faculty. To achieve this purpose, the study addressed the following research questions:

RQ1. What latent factor structure best represents the Conscious Adaptive Teaching Scale (CATS)?

RQ2. To what extent does the Conscious Adaptive Teaching Scale demonstrate satisfactory construct validity, including evidence of convergent and discriminant validity?

RQ3. To what extent does the Conscious Adaptive Teaching Scale demonstrate acceptable reliability?

THEORETICAL FOUNDATION AND LITERATURE REVIEW

The Conscious Adaptive Teaching Scale (CATS) is grounded in the Conscious Adaptive Teaching (CAT) framework (Bull, 2026), a middle-range theory conceptualizing adaptive teaching as consciously regulated instructional decision-making. Rather than emphasizing observable instructional behaviors alone, CAT proposes that educators recognize instructional complexity, evaluate pedagogical alternatives, implement responsive and inclusive practices, and reflect on instructional effectiveness. These processes provide the conceptual basis for operationalizing Conscious Adaptive Teaching as a multidimensional construct.

CAT extends the Conscious Intelligence Integration Framework (CIIF) (Bull, 2026), which conceptualizes intentional human judgment as governed by higher-order cognitive processes rather than automatic or reactive responses. Applied to higher education, these principles explain how faculty interpret changing instructional conditions, regulate pedagogical decisions, and adapt practice to learner needs. Recognition of instructional complexity, including differences in preparedness, motivation, culture, technological proficiency, and learning needs, serves as the initiating condition for this deliberate adaptive process.

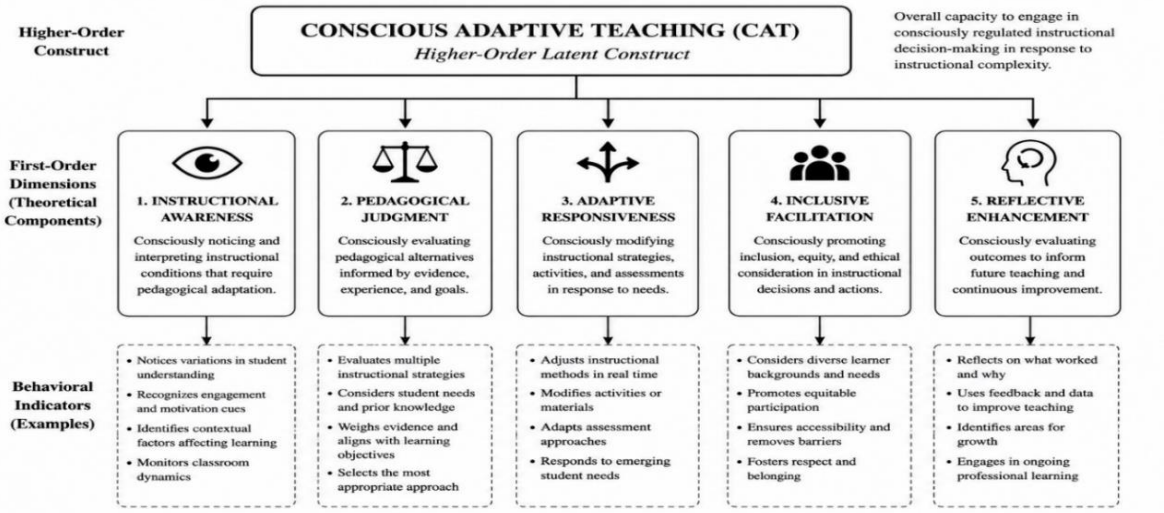
The framework conceptualizes Conscious Adaptive Teaching as a higher-order construct comprising five interrelated dimensions: Instructional Awareness, recognizing conditions requiring adaptation; Pedagogical Judgment, evaluating instructional alternatives; Adaptive Responsiveness, implementing appropriate modifications; Inclusive Facilitation, promoting equitable, accessible, and culturally responsive learning; and Reflective Enhancement, evaluating outcomes to improve subsequent practice. Although distinct, the dimensions collectively represent consciously regulated instructional adaptation.

By emphasizing the cognitive and reflective processes underlying instructional action, CAT extends perspectives focused primarily on instructional flexibility, differentiated instruction, and adaptive expertise (Corno, 2008; Parsons et al., 2018). The framework therefore provides a theoretical basis for explaining and empirically measuring how educators consciously

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interpret instructional complexity, make pedagogical judgments, adapt instruction, facilitate inclusive learning, and refine practice through reflection. Guided by this framework, the present study developed and validated the Conscious Adaptive Teaching Scale (CATS) using established principles of educational and psychological measurement (American Educational Research Association [AERA], American Psychological Association [APA], & National Council on Measurement in Education [NCME], 2014; DeVellis & Thorpe, 2021). The multidimensional structure proposed by the CAT framework is illustrated in Figure 1, while the following literature review examines the empirical evidence supporting each theoretical dimension and provides the rationale for their operationalization within the CATS.

Figure 1. Conceptual Operationalization of the Conscious Adaptive Teaching Framework



Note. The model illustrates the conceptual operationalization of the Conscious Adaptive Teaching (CAT) framework. Conscious Adaptive Teaching is proposed as a higher-order latent construct reflected by five first-order dimensions. Each dimension is defined by behavioral indicators that informed the deductive development of items for the Conscious Adaptive Teaching Scale (CATS).

II. LITERATURE REVIEW

A focused literature review established the theoretical and empirical foundations of Conscious Adaptive Teaching and examined measures related to adaptive teaching, teacher cognition, instructional decision-making, reflective practice, inclusive teaching, and faculty effectiveness. ERIC, PsycINFO, Scopus, Web of Science, Education Source, and Google Scholar were searched primarily for peer-reviewed literature published between 2015 and 2026, while relevant seminal works were retained. Search terms included combinations of *adaptive teaching*, *teacher cognition*, *instructional decision-making*, *adaptive expertise*, *reflective practice*, *inclusive teaching*, *faculty development*, *teacher effectiveness*, *scale development*, and *psychometric validation*. The literature informed the CAT dimensions, identified existing measurement approaches, and established the conceptual basis for developing the CATS.

Dimensions of Conscious Adaptive Teaching.

Growing instructional complexity requires faculty to respond to learner diversity, technological change, and evolving educational expectations through continuous interpretation, decision-making, and instructional adaptation (Dumont et al., 2024; du Plooy et al., 2024; Suyo-Vega et al., 2024). The Conscious Adaptive Teaching (CAT) framework conceptualizes this process as a higher-order construct comprising five interrelated dimensions: Instructional Awareness, Pedagogical Judgment, Adaptive Responsiveness, Inclusive Facilitation, and Reflective Enhancement (Bull, 2026). CAT is conceptualized not as cognition isolated from behavior, but as a regulated instructional process linking recognition, judgment, action, inclusion, and reflection. The dimensions therefore occupy complementary stages of adaptive instructional regulation rather than representing interchangeable manifestations of a single behavioral domain.

Instructional Awareness. Instructional Awareness is the capacity to recognize and interpret conditions affecting student learning. Related to teacher or professional noticing, it involves identifying meaningful indicators of understanding, engagement, participation, and learner needs that may require instructional adjustment (Blair et al., 2024). In higher education, this awareness extends to learner diversity, technological influences, and contextual complexity (Dumont et al., 2024). It therefore provides the perceptual foundation for consciously adaptive instructional decision-making.

Pedagogical Judgment. Pedagogical Judgment involves deliberately evaluating instructional alternatives and selecting approaches aligned with learning objectives, learner characteristics, and contextual demands. It integrates professional knowledge, instructional evidence, and situational information (Shulman, 1987), including formative assessment, student feedback, learning analytics, and educational research (Brown et al., 2023; Hattie, 2023). Consistent with reflection-in-action and adaptive expertise (Schön, 1983; Hammerness et al., 2022), it translates instructional awareness into purposeful pedagogical decisions.

Adaptive Responsiveness. Adaptive Responsiveness represents the intentional translation of pedagogical judgments into instructional action, including adjustments to pacing, explanations, learning activities, assessments, and student support (Hammerness et al., 2022; Suh et al., 2024). Grounded in adaptive expertise (Hatano & Inagaki, 1986), it emphasizes flexible and purposeful responses when routine approaches are insufficient (Hammerness et al., 2022; Serrière & Daniela, 2025). Such responsiveness can strengthen engagement and learning when adaptations are aligned with evolving learner needs (du Plooy et al., 2024; Bull, 2026).

Inclusive Facilitation. Inclusive Facilitation concerns whether instructional decisions provide equitable, accessible, and culturally responsive opportunities for participation and success (Bull, 2026). Diverse student populations require approaches that recognize learner variability while maintaining academic expectations (Merriam & Bierema, 2024). Inclusive and culturally responsive practices can support engagement, achievement, psychological safety, and belonging (Hurtado et al., 2012; Strayhorn, 2019), while Universal Design for Learning emphasizes reducing unnecessary barriers to learning (CAST, 2024; Gay, 2018). Within CAT, Inclusive Facilitation therefore represents the equity-oriented dimension of adaptive decision-making.

Reflective Enhancement. Reflective Enhancement completes the adaptive cycle by evaluating instructional decisions and using evidence to improve subsequent practice (Bull, 2026). Building on reflection-in-action and reflection-on-action (Schön, 1983), educators critically examine instructional assumptions and outcomes rather than relying on experience alone (Brookfield, 2017). Evidence from assessments, feedback, learning analytics, observation, and self-evaluation can inform this process (Hattie, 2023). Consistent with experiential and adult learning perspectives (Kolb, 1984; Merriam & Bierema, 2024), reflection feeds back into instructional awareness and pedagogical judgment, making Conscious Adaptive Teaching a recursive process of continuous improvement.

Existing Measures and the Measurement Gap

Existing instruments assess constructs related to Conscious Adaptive Teaching (CAT), including instructional quality, teacher efficacy, reflective practice, differentiated instruction, adaptive expertise, and inclusive teaching. These include measures of instructional quality (Fauth et al., 2014; Scherer et al., 2016), the Teachers' Sense of Efficacy Scale (Tschannen-Moran & Woolfolk Hoy, 2001), the English Language Teaching Reflection Inventory (Akbari et al., 2010), the Differentiated Instruction Scale (Roy et al., 2013), adaptive expertise measures (Ferguson et al., 2018), and instruments addressing inclusive and culturally responsive teaching (Lombardi et al., 2011; Siwatu, 2007).

Although these instruments capture important aspects of effective and adaptive teaching, they generally assess discrete behaviors, beliefs, competencies, or practices rather than an integrated process of consciously regulated instructional adaptation. Specifically, they do not jointly operationalize Instructional Awareness, Pedagogical Judgment, Adaptive Responsiveness, Inclusive Facilitation, and Reflective Enhancement as interrelated dimensions of a unified construct. The Conscious Adaptive Teaching Scale (CATS) was developed to address this measurement gap by integrating these processes within a theoretically grounded multidimensional measure of conscious adaptive teaching. Table 1 represents measures related to CAT.

Table 1. Representative Measures Related to Conscious Adaptive Teaching

Related construct	Representative measure	Primary focus	Relationship to CAT
Instructional quality	Instructional-quality measures (Fauth et al., 2014; Scherer et al., 2016)	Classroom management, cognitive activation, teacher support	Assesses instructional quality rather than the integrated CAT process
Teacher efficacy	Teachers' Sense of Efficacy Scale (TSES)	Engagement, instructional strategies, classroom management	Measures perceived capability

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Reflective practice	English Language Teaching Reflection Inventory (ELTRI)	Multiple dimensions of teacher reflection	Overlaps with Reflective Enhancement
Differentiated instruction	Differentiated Instruction Scale (DIS)	Instructional adaptation and progress monitoring	Closely related to Adaptive Responsiveness
Adaptive expertise	Adaptive expertise measures	Flexible and innovative professional responses	Related to adaptive judgment and responsiveness
Inclusive teaching	Inclusive Teaching Strategies Inventory (ITSI)	Inclusive instructional practices	Overlaps with Inclusive Facilitation
Culturally responsive teaching	Culturally Responsive Teaching Self-Efficacy Scale (CRTSE)	Perceived capability for culturally responsive teaching	Related to Inclusive Facilitation

Note. The measures represent conceptually related constructs but differ in their intended purposes and theoretical structures.

III. METHODOLOGY

This study employed an instrument development and psychometric validation design to develop and evaluate the Conscious Adaptive Teaching Scale (CATS). Guided by established measurement principles (AERA, APA, & NCME, 2014; DeVellis & Thorpe, 2021), scale development involved construct specification (Table 2), deductive item generation, expert content validation, pilot testing, and large-scale psychometric evaluation.

Table 2. Construct Specification for the Conscious Adaptive Teaching Scale

Dimension	Operational Definition	Representative Behavioral Indicators
Instructional Awareness	Conscious recognition and interpretation of instructional conditions requiring pedagogical attention	Monitors student engagement; recognizes learner variability; identifies instructional barriers; interprets classroom feedback
Pedagogical Judgment	Deliberate evaluation and selection of instructional strategies using evidence and contextual information	Evaluates instructional alternatives; integrates educational evidence; justifies instructional decisions
Adaptive Responsiveness	Intentional modification of instructional approaches in response to student learning	Adjusts instructional pacing; modifies teaching strategies; provides alternative explanations; revises instructional approaches
Inclusive Facilitation	Conscious regulation of instructional practices that promote equitable participation and accessibility	Encourages equitable participation; supports diverse learners; reduces instructional barriers; applies inclusive practices
Reflective Enhancement	Continuous evaluation and refinement of instructional practice through systematic reflection	Evaluates instructional effectiveness; interprets student feedback; incorporates lessons learned into future teaching

Note. Behavioral indicators served as the conceptual blueprint for deductive item generation and are illustrative rather than exhaustive.

Construct specification defined the five theoretical dimensions and corresponding behavioral indicators, providing the conceptual blueprint for item development and ensuring adequate construct representation. Following pilot testing, the final 35-item CATS was administered cross-sectionally to 350 higher education faculty. The full sample was used for EFA and CFA, followed by assessments of convergent and discriminant validity, higher-order structural validity, and reliability**.**

Item Generation. Following construct specification, questionnaire items were generated deductively from the operational definitions and behavioral indicators associated with each CAT dimension. This theory-driven approach ensured close alignment between the instrument and the conceptual framework while avoiding adaptation from existing teaching instruments (Clark & Watson, 2019). An initial pool of 40 items was developed, with eight items representing each of the five dimensions, to provide sufficient coverage for subsequent refinement (Boateng et al., 2018). Items were written according to established questionnaire design principles. Each item assessed a single behavioral concept using concise,

faculty-centered language. Negatively worded, double-barreled, ambiguous, and jargon-laden statements were avoided to minimize measurement error and improve response accuracy (DeVellis & Thorpe, 2021). Responses were recorded on a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

Conscious Adaptive Teaching Scale (CATS)

Instructions: The Conscious Adaptive Teaching Scale (CATS) is designed to assess faculty members' self-perceived adaptive teaching practices across five dimensions of Conscious Adaptive Teaching. Respondents should consider their typical instructional practices and indicate the extent to which they agree with each statement.

There are no right or wrong answers. Responses should reflect typical teaching behavior rather than ideal practice.

Response Scale. Please indicate your level of agreement with each statement using the following five-point Likert scale: 1 (*Strongly Disagree*) to 5 (*Strongly Agree*), with higher scores indicating higher levels of Conscious Adaptive Teaching.

Dimension I: Instructional Awareness (IA). Instructional Awareness reflects the instructor's ability to recognize learner characteristics, monitor classroom dynamics, and intentionally adapt instruction based on students' academic and learning needs.

Item	Statement
IA1	I consciously monitor whether students understand the material during instruction.
IA2	I recognize differences in students' learning needs while teaching.
IA3	I adjust my teaching when I notice students struggling to understand concepts.
IA4	I intentionally consider students' prior knowledge when planning instruction.
IA5	I regularly evaluate whether my instructional strategies meet students' learning needs.
IA6	I remain aware of changes in student engagement throughout the learning process.
IA7	I reflect on how my instructional decisions influence student learning.

Dimension II: Pedagogical Judgment (PJ). Pedagogical Judgment reflects instructors' ability to make informed instructional decisions based on evidence, professional expertise, and educational best practices.

Item	Statement
PJ1	I select instructional strategies based on students' learning needs rather than routine practice.
PJ2	I critically evaluate alternative teaching approaches before making instructional decisions.
PJ3	I modify my instructional methods when evidence suggests improvement is needed.
PJ4	I use student feedback to guide instructional decisions.
PJ5	I intentionally align teaching strategies with course learning outcomes.
PJ6	I evaluate the effectiveness of instructional decisions after each learning activity.
PJ7	I base instructional decisions on educational evidence rather than personal preference.

Dimension III: Adaptive Responsiveness (AR). Adaptive Responsiveness reflects instructors' ability to modify instruction in response to changing learning conditions.

Item	Statement
AR1	I modify instructional activities when students require additional support.
AR2	I adapt my teaching style to accommodate diverse learners.
AR3	I respond quickly when students experience learning difficulties.
AR4	I adjust classroom activities to improve student participation.
AR5	I use multiple instructional approaches to address varying student needs.
AR6	I modify instruction when classroom circumstances change unexpectedly.
AR7	I remain flexible when instructional plans require adjustment.

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Dimension IV: Inclusive Facilitation (IF). Inclusive Facilitation reflects the instructor's ability to create equitable, supportive, and engaging learning environments.

Item	Statement
IF1	I encourage participation from all students regardless of background.
IF2	I create learning environments where students feel respected.
IF3	I encourage students to express diverse viewpoints during class discussions.
IF4	I adapt instructional activities to support inclusive learning.
IF5	I intentionally promote equitable participation among students.
IF6	I foster an environment where students feel comfortable asking questions.
IF7	I encourage collaboration among students with diverse perspectives.

Dimension V: Réflective Enhancement (RE). Reflective Enhancement reflects instructors' ongoing evaluation and improvement of their instructional effectiveness.

Item	Statement
RE1	I regularly reflect on the effectiveness of my teaching.
RE2	I seek feedback to improve my instructional practice.
RE3	I modify future instruction based on previous teaching experiences.
RE4	I evaluate whether instructional changes improve student learning.
RE5	I engage in continuous professional learning to improve my teaching.
RE6	I critically examine my instructional strengths and weaknesses.
RE7	I intentionally implement improvements identified through reflection.

Scoring Procedures: The CATS consists of 35 positively worded items representing five dimensions: Instructional Awareness, Pedagogical Judgment, Adaptive Responsiveness, Inclusive Facilitation, and Reflective Enhancement. Each dimension contains seven items rated from 1 (Strongly Disagree) to 5 (Strongly Agree); no reverse scoring is required. Dimension scores may be calculated as either summed scores (7–35) or mean scores (1.00–5.00). The overall CATS score may likewise be expressed as a summed score (35–175) or mean score (1.00–5.00), with higher scores indicating greater Conscious Adaptive Teaching.

CATS Scoring Structure

Dimension	Items	Sum Score Range	Mean Score Range
Instructional Awareness	IA1–IA7	7–35	1.00–5.00
Pedagogical Judgment	PJ1–PJ7	7–35	1.00–5.00
Adaptive Responsiveness	AR1–AR7	7–35	1.00–5.00
Inclusive Facilitation	IF1–IF7	7–35	1.00–5.00
Reflective Enhancement	RE1–RE7	7–35	1.00–5.00
Overall CATS	**35 items**	**35–175**	**1.00–5.00**

For descriptive interpretation, mean and total scores may be classified using the provisional ranges shown below. Provisional Interpretation of CATS Scores

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Mean Score	Total Score	Interpretation
4.50–5.00	158–175	Very High Conscious Adaptive Teaching
3.50–4.49	123–157	High Conscious Adaptive Teaching
2.50–3.49	88–122	Moderate Conscious Adaptive Teaching
1.50–2.49	53–87	Low Conscious Adaptive Teaching
1.00–1.49	35–52	Very Low Conscious Adaptive Teaching

Note. These categories are provisional and intended for descriptive and research purposes rather than as empirically established diagnostic or evaluative cut scores. They may be refined as normative evidence becomes available across faculty populations and institutional services.

Content Validation

The preliminary 40-item CATS underwent expert content validation to evaluate the relevance, clarity, and representativeness of each item relative to the five dimensions of the CAT framework. Content validation provided evidence based on test content before evaluation of the instrument's internal structure (AERA et al., 2014; Boateng et al., 2018).

A purposive panel of seven subject matter experts representing higher education, instructional design, educational psychology, faculty development, educational measurement, and quantitative research independently evaluated each item using Lynn's (1986) four-point relevance scale (1 = *not relevant* to 4 = *highly relevant*). Experts also provided qualitative feedback regarding wording, clarity, redundancy, and conceptual alignment.

Content validity was evaluated using the Item-Level Content Validity Index (I-CVI), Scale-Level Content Validity Index (S-CVI/Ave), and the **modified kappa coefficient (κ)*. Items with an I-CVI below .78 were reviewed alongside expert comments and revised or removed while maintaining balanced representation across the five theoretical dimensions (Polit & Beck, 2006). Tables 3 and 4 below present the validation procedure and outcomes respectively.

Table 3. Content Validation Procedures

Component	Description
Validation approach	Expert panel review
Number of experts	7
Areas of expertise	Higher education, instructional design, educational psychology, educational measurement, faculty development, quantitative research
Rating scale	Four-point relevance scale (1 = not relevant to 4 = highly relevant)
Quantitative indices	I-CVI, S-CVI/Ave, modified κ*
Decision criterion	I-CVI ≥ .78
Qualitative evaluation	Clarity, wording, redundancy, readability, conceptual alignment
Outcome	Item revision and reduction prior to pilot testing

Table 4. Summary of Content Validation Outcomes

Statistic	Recommended Criterion	Obtained Value	Interpretation
Number of Experts	≥ 6	7	Adequate panel size
I-CVI	≥ .78	.86–1.00	Excellent item relevance
S-CVI/Ave	≥ .90	.96	Excellent scale content validity
Modified κ*	≥ .74	.84–1.00	Excellent agreement beyond chance
Initial Item Pool	—	40	—
Items Removed	—	4	Redundancy and wording refinement
Instrument Following Content Validation	—	36	Advanced to pilot testing

Note. I-CVI = Item-Level Content Validity Index; S-CVI/Ave = Scale-Level Content Validity Index (Average Method); κ* = modified kappa coefficient adjusted for chance agreement.

Instrument Refinement. Expert review resulted primarily in editorial revisions that improved readability, conceptual precision, and consistency across dimensions. Four conceptually redundant items were removed while preserving balanced representation of the five CAT dimensions, producing a 36-item version of the instrument for pilot testing.

Pilot Testing

The 36-item CATS was pilot tested with 35 eligible higher education faculty to assess item clarity, usability, response characteristics, and preliminary reliability (Boateng et al., 2018; DeVellis & Thorpe, 2021). Participants reported that the online instrument was clear and easy to complete, with an average completion time of approximately 12 minutes. Based on participant feedback, item analysis, and conceptual review, minor wording revisions were made and one redundant item was removed, yielding the final 35-item CATS for large-scale psychometric validation. Table 5 and 6 give a summary of the pilot testing and results, respectively.

Table 5. Pilot Testing Summary

Characteristic	Result
Pilot participants	35 faculty members
Recruitment	Convenience sample
Administration mode	Online questionnaire
Average completion time	Approximately 12 minutes
Response format	Five-point Likert scale
Overall participant feedback	Positive
Primary revisions	Wording refinement and reduction of redundancy
Items before pilot	36
Additional item removed	1
Final validation instrument	35 items

Note. Pilot participants were excluded from the primary validation sample to maintain separation between instrument refinement and formal psychometric evaluation.

Pilot-Test Results. The 36-item preliminary CATS was pilot tested with 35 higher education faculty participants who were separate from the primary validation sample. Preliminary internal-consistency analysis indicated acceptable to strong reliability across the five dimensions. Cronbach's alpha coefficients ranged from .793 to .869, while the overall 35-item CATS demonstrated an alpha of .899.

Table 6. Pilot-Test Reliability and Item-Total Correlations for the Conscious Adaptive Teaching Scale (CATS)

Dimension	Items Retained	Cronbach's α	Corrected Item-Total *r* Range
Instructional Awareness	7	.869	.573–.754
Pedagogical Judgment	7	.854	.526–.767
Adaptive Responsiveness	7	.864	.427–.823
Inclusive Facilitation	7	.799	.365–.703
Reflective Enhancement	7	.793	.418–.623
Overall CATS	35	.899	—

Item-level examination also identified redundancy between RE7 and the additional pilot item RE8, which correlated at r = .939. Because the two items provided highly overlapping information, the redundant item was removed. This refinement reduced the pilot instrument from 36 to 35 items, leaving seven indicators for each of the five theoretically specified CATS dimensions. The resulting 35-item instrument was then appropriate for administration to the primary validation sample (N = 350).

Participants and Instrument. The study included 350 faculty members from accredited U.S. higher education institutions, purposively recruited through academic and professional networks. Eligible participants were adults proficient in English and actively teaching undergraduate, graduate, or professional courses; nonteaching administrators were excluded (Boateng

et al., 2018). Participants completed the 35-item CATS, comprising five dimensions with seven items each, rated from 1 (Strongly Disagree) to 5 (Strongly Agree). Dimension and overall scores were calculated as item means, with higher scores indicating greater Conscious Adaptive Teaching. The complete CATS is provided in Appendix A.

Data Collection Procedures. Data were collected over a six-week period using a secure online survey platform. After providing electronic informed consent, participants completed a demographic questionnaire followed by the 35-item CATS. Demographic variables included age, gender, academic rank, instructional modality, years of teaching experience, institutional type, and appointment status. A total of 365 faculty members completed the survey. Following screening for duplicate, incomplete, ineligible, and poor-quality responses, 350 participants were retained as the primary psychometric validation sample. Pilot participants were excluded from this sample. Prior to analysis, responses were screened for duplicate submissions, excessive missing data, uniform response patterns, implausibly short completion times, and other indicators of inattentive responding. The resulting N = 350 dataset was used for the exploratory, confirmatory, validity, and reliability analyses reported in the study.

Data Analysis. The validation dataset (N = 350) was screened for completeness, response quality, outliers, and distributional concerns. EFA using principal axis factoring with Promax rotation examined the factor structure, followed by CFA to evaluate the five-factor and higher-order models. Model fit, convergent and discriminant validity, and standardized loadings were assessed using established psychometric criteria. Reliability was evaluated using Cronbach's alpha, McDonald's omega, composite reliability, and corrected item-total correlations. Analyses were conducted using IBM SPSS Statistics and AMOS, with findings interpreted in relation to the theoretical CAT framework.

IV. RESULTS

All 350 questionnaires were complete, with no missing responses across the 35 CATS items; therefore, no imputation or case deletion was required. Item means ranged from 2.80 to 2.98 (M = 2.90), with an average standard deviation of 1.27, indicating adequate response variability. Item distributions showed minimal asymmetry, with skewness ranging from −0.01 to 0.25 (M = 0.13). Kurtosis ranged from −1.14 to −0.76 (M = −1.00), indicating moderately platykurtic distributions. Overall, the data demonstrated adequate variability and no substantial distributional concerns for the subsequent factor analyses. The descriptive statistics is presented in Table 7 below.

Table 7. Descriptive Statistics for the Conscious Adaptive Teaching Scale (N = 350)

Statistic	Value
Number of participants	350
Number of CATS items	35
Missing responses	0
Mean item score (average)	2.90
Range of item means	2.80–2.98
Average item standard deviation	1.27
Average skewness	0.13
Skewness range	−0.01 to 0.25
Average kurtosis	−1.00
Kurtosis range	−1.14 to −0.76

Note. Descriptive statistics summarize the distribution of responses across all 35 CATS items. Negative kurtosis values indicate relatively flat response distributions (platykurtic) but remain within acceptable limits for exploratory factor analysis.

Participant Characteristics. The validation sample included 350 higher education faculty members. Women represented 55.1% of participants, men 42.3%, and 2.6% preferred not to disclose gender. The largest age group was 35–44 years (30.6%), followed by 45–54 (23.7%), 55–64 (20.9%), 25–34 (19.7%), and ≥65 years (5.1%). Assistant professors comprised 35.1% of the sample, followed by associate professors (26.3%), instructors (23.7%), and professors (14.9%). Teaching modalities included online (44.9%), face-to-face (30.3%), and hybrid (24.9%). Participant characteristics are summarized in Table 8.

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Table 8. Demographic Characteristics of the Validation Sample (N = 350)

Characteristic	Category	n	%
Gender	Female	193	55.1
	Male	148	42.3
	Prefer not to disclose	9	2.6
Age Group	25–34 years	69	19.7
	35–44 years	107	30.6
	45–54 years	83	23.7
	55–64 years	73	20.9
	65 years or older	18	5.1
Academic Rank	Instructor	83	23.7
	Assistant Professor	123	35.1
	Associate Professor	92	26.3
	Professor	52	14.9
Teaching Modality	Online	157	44.9
	Face-to-face	106	30.3
	Hybrid	87	24.9

Note. Percentages may not total exactly 100% because of rounding.

RQ1. What Latent Factor Structure Best Represents the Conscious Adaptive Teaching Scale (CATS)?

To address RQ1, an exploratory factor analysis (EFA) was conducted using the full validation sample (**N = 350**) to determine the latent factor structure underlying the 35-item Conscious Adaptive Teaching Scale (CATS). Principal axis factoring with Promax rotation was used because the dimensions of Conscious Adaptive Teaching were theoretically expected to be correlated. Factor retention was evaluated using eigenvalues, scree-plot inspection, Horn's parallel analysis, and theoretical interpretability. The rotated factor solution was subsequently examined using pattern coefficients, communalities, cross-loadings, and inter-factor correlations.

Factorability of the Correlation Matrix. Prior to factor extraction, the suitability of the 35-item correlation matrix for factor analysis was evaluated using the determinant of the correlation matrix, the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy, and Bartlett's test of sphericity. The determinant was 1.15×10^{-7}, indicating substantial inter-item relationships without evidence that multicollinearity was sufficiently severe to preclude factor analysis. The overall KMO was .920, demonstrating excellent sampling adequacy. Bartlett's test of sphericity was statistically significant, $\chi^2(595) = 5377.64$, $p < .001$, indicating that the correlation matrix differed significantly from an identity matrix. Collectively, these findings demonstrated that the N = 350 dataset was well suited for exploratory factor analysis.

Table 9. Factorability Assessment for the CATS (N = 350)

Statistic	Result	Interpretation
Number of participants	350	Adequate sample
Number of items	35	—
Correlation matrix determinant	1.15×10^{-7}	No prohibitive multicollinearity
KMO	.920	Excellent sampling adequacy
Bartlett's χ^2	5377.64	Statistically significant
df	595	—
p	< .001	Correlation matrix is factorable

Factor Retention. The initial eigenvalues of the correlation matrix were examined to determine the number of potentially meaningful factors. The first five eigenvalues were 9.05, 3.08, 2.82, 2.60, and 2.41. The sixth eigenvalue declined sharply to 0.85, with subsequent eigenvalues remaining below 1.00. The first five components based on the initial correlation matrix collectively accounted for approximately 57.02% of the total item variance.

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Horn's parallel analysis provided additional support for retaining five factors. The observed eigenvalues for Factors 1 through 5 exceeded their corresponding 95th-percentile eigenvalues obtained from random data, whereas the sixth observed eigenvalue (0.85) fell below the corresponding random-data value (approximately 1.40). Thus, the empirical eigenvalue pattern, parallel analysis, and theoretical interpretability converged in supporting a five-factor solution. See Table 10.

Table 10. Observed Eigenvalues and Horn's Parallel Analysis for Factor Retention

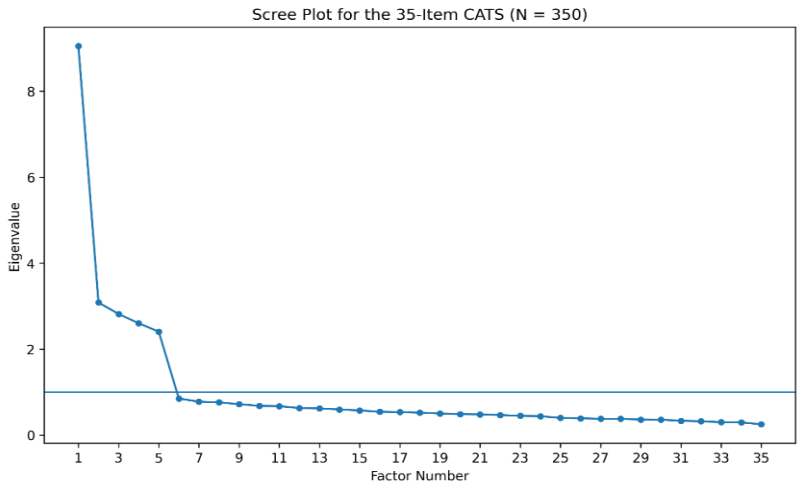
Factor	Observed Eigenvalue	95th-Percentile Random Eigenvalue	Decision
1	9.05	1.73	Retain
2	3.08	1.62	Retain
3	2.82	1.56	Retain
4	2.60	1.50	Retain
5	2.41	1.45	Retain
6	0.85	1.40	Do not retain

Note. Parallel analysis was based on random datasets matching the observed sample size (N = 350) and number of variables (p = 35). Factor retention was supported when the observed eigenvalue exceeded the corresponding 95th-percentile random eigenvalue.

Scree Plot. Visual inspection of the scree plot was used alongside Horn's parallel analysis to determine the number of factors to retain. As shown in Figure 2, the first eigenvalue was substantially larger than the remaining eigenvalues, followed by four additional eigenvalues above 1.00. A clear decline occurred between the fifth and sixth factors, with the sixth eigenvalue falling below 1.00. The first six eigenvalues were 9.051, 3.083, 2.818, 2.600, 2.406, and 0.849, respectively. The leveling of the curve after Factor 5 provides visual support for retaining a five-factor solution.

The horizontal reference line represents an eigenvalue of 1.00. The marked decline between Factors 5 and 6, followed by a comparatively gradual leveling of subsequent eigenvalues, supports retention of five factors. Factor retention was additionally evaluated using Horn's parallel analysis and theoretical interpretability. The scree pattern was also consistent with this interpretation, with a pronounced decline following the fifth factor. Taken together, the eigenvalue criterion, scree pattern, parallel analysis, and theoretical structure supported retention of five factors.

Figure 2: Scree Plot of Eigenvalues for the 35-Item Conscious Adaptive Teaching Scale (CATS)



Note. The scree plot displays the eigenvalues obtained from the correlation matrix of the 35 CATS items (N = 350).

Factor Extraction and Rotated Pattern Matrix

Principal axis factoring with Promax rotation produced a clear five-factor solution corresponding to the theoretically proposed dimensions of Instructional Awareness (IA), Pedagogical Judgment (PJ), Adaptive Responsiveness (AR), Inclusive Facilitation (IF), and Reflective Enhancement (RE). Each set of seven items loaded most strongly on its intended factor.

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Primary pattern coefficients ranged from approximately .521 to .783. Instructional Awareness loadings ranged from .521 to .758, Pedagogical Judgment from .549 to .768, Adaptive Responsiveness from .562 to .777, Inclusive Facilitation from .549 to .771, and Reflective Enhancement from .587 to .783. Cross-loadings were small throughout the solution, with none approaching a magnitude that would suggest substantial factorial ambiguity. See Table 11.

Table 11. Promax-Rotated Pattern Matrix and Communalities for the Five-Factor CATS Solution

IA Item	Loading	PJ Item	Loading	AR Item	Loading	IF Item	Loading	RE Item	Loading	h^2 Range
IA1	**.720**	PJ1	**.731**	AR1	**.674**	IF1	**.754**	RE1	**.770**	.472–.587
IA2	**.758**	PJ2	**.768**	AR2	**.666**	IF2	**.691**	RE2	**.758**	.506–.556
IA3	**.647**	PJ3	**.739**	AR3	**.705**	IF3	**.771**	RE3	**.749**	.485–.596
IA4	**.745**	PJ4	**.743**	AR4	**.743**	IF4	**.696**	RE4	**.744**	.510–.567
IA5	**.677**	PJ5	**.702**	AR5	**.777**	IF5	**.742**	RE5	**.783**	.446–.588
IA6	**.663**	PJ6	**.707**	AR6	**.678**	IF6	**.734**	RE6	**.653**	.449–.496
IA7	**.521**	PJ7	**.549**	AR7	**.562**	IF7	**.549**	RE7	**.587**	.299–.384

Note. Extraction method = principal axis factoring. Rotation method = Promax. Bold values represent the primary loading for each item. IA = Instructional Awareness; PJ = Pedagogical Judgment; AR = Adaptive Responsiveness; IF = Inclusive Facilitation; RE = Reflective Enhancement; h^2 = communality.

The pattern matrix provides particularly strong evidence for the interpretability of the five-factor solution. All 35 items had their largest loading on their theoretically intended dimension, and the absence of substantial cross-loadings indicated clear separation of item content across the five factors.

Communalities. Final communality estimates ranged from .299 to .596. Most items demonstrated moderate representation by the retained factor solution. IA7 had the lowest communality (h^2 = .299), followed by PJ7 (h^2 = .339), AR7 (h^2 = .342), IF7 (h^2 = .376), and RE7 (h^2 = .384). Despite their comparatively lower communalities, each of these items demonstrated a clear primary loading on its intended factor and no problematic cross-loading. Accordingly, the EFA results did not provide a compelling statistical basis for item removal at this stage; the items could appropriately be retained for subsequent confirmatory evaluation.

Inter-Factor Correlations. Because Promax is an oblique rotation, correlations among the five factors were examined. The factor correlations ranged from approximately **.**257 to .443, indicating moderate relationships without suggesting redundancy among the dimensions.

The moderate positive correlations support the theoretical expectation that the five dimensions represent interconnected aspects of Conscious Adaptive Teaching while retaining sufficient empirical distinction to be modeled as separate first-order factors. The strongest relationship occurred between Inclusive Facilitation and Reflective Enhancement (r = .443), whereas the weakest occurred between Instructional Awareness and Inclusive Facilitation (r = .257). See Table 12.

Table 12. Factor Correlation Matrix

Factor	IA	PJ	AR	IF	RE
IA	1.000				
PJ	.316	1.000			
AR	.322	.361	1.000		
IF	.257	.334	.393	1.000	
RE	.347	.397	.413	.443	1.000

Note. IA = Instructional Awareness; PJ = Pedagogical Judgment; AR = Adaptive Responsiveness; IF = Inclusive Facilitation; RE = Reflective Enhancement.

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RQ2: To what extent does the Conscious Adaptive Teaching Scale demonstrate satisfactory construct validity, including evidence of convergent and discriminant validity?

Construct validity was evaluated through confirmatory factor analysis (CFA), convergent validity, discriminant validity, and higher-order CFA. The analyses examined whether the five dimensions identified through EFA: Instructional Awareness (IA), Pedagogical Judgment (PJ), Adaptive Responsiveness (AR), Inclusive Facilitation (IF), and Reflective Enhancement (RE), were supported by the proposed measurement model and could be represented as related dimensions of Conscious Adaptive Teaching.

Confirmatory Factor Analysis. A five-factor CFA was conducted using maximum likelihood estimation in IBM SPSS AMOS. The model specified 35 observed indicators, with seven items loading on each of the five theoretically designated latent factors. The first-order factors were permitted to correlate, consistent with the CAT framework, which conceptualizes them as distinct but interrelated dimensions of adaptive instructional decision-making.

The five-factor model demonstrated excellent fit to the data, $\chi^2(550) = 539.97$, $\chi^2/df = 0.98$, CFI = 1.000, TLI = 1.002, RMSEA = .000, and SRMR = .040. The TLI value slightly exceeding 1.00 and RMSEA of zero resulted from the model chi-square being lower than its degrees of freedom and were interpreted as indicating minimal model-data discrepancy rather than fit exceeding a theoretical maximum.

Standardized factor loadings ranged from .543 to .765. All 35 items loaded positively on their theoretically specified dimensions, providing initial confirmatory evidence for the five-factor structure identified through EFA. The standardized loadings are presented in Table 12.

Convergent Validity. Convergent validity was evaluated using standardized factor loadings, average variance extracted (AVE), and composite reliability (CR). As shown in Table 14, CR values ranged from .857 to .884, exceeding the conventional .70 criterion for all five dimensions. AVE values ranged from .464 to .522. See Table 13.

Table 13. Convergent Validity of the Conscious Adaptive Teaching Scale

Dimension	AVE	CR
Instructional Awareness (IA)	.464	.857
Pedagogical Judgment (PJ)	.501	.875
Adaptive Responsiveness (AR)	.473	.862
Inclusive Facilitation (IF)	.507	.877
Reflective Enhancement (RE)	.522	.884

Pedagogical Judgment, Inclusive Facilitation, and Reflective Enhancement met or exceeded the conventional AVE criterion of .50. Instructional Awareness (AVE = .464) and Adaptive Responsiveness (AVE = .473) fell slightly below this benchmark. However, both dimensions demonstrated strong composite reliability, and their standardized item loadings were generally satisfactory. Accordingly, the combined evidence from standardized loadings, AVE, and CR provided substantial, although not uniform, support for convergent validity across the five CATS dimensions.

Discriminant Validity. Discriminant validity was assessed using the Fornell–Larcker criterion and the heterotrait–monotrait ratio of correlations (HTMT). See Table 14.

Table 14. HTMT Ratios Among CATS Dimensions

Dimension Pair	HTMT
IA–PJ	.322
IA–AR	.328
IA–IF	.262
IA–RE	.362
PJ–AR	.365
PJ–IF	.341
PJ–RE	.399
AR–IF	.406
AR–RE	.411
IF–RE	.455

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Fornell–Larcker assessment was done using the square root of the AVE for each construct was compared with its correlations with the remaining constructs. The square roots of AVE were .681 for IA, .708 for PJ, .688 for AR, .712 for IF, and .723 for RE. In each case, the square root of AVE exceeded the corresponding interconstruct correlations, supporting empirical distinction among the five dimensions. HTMT provided additional evidence of discriminant validity. Values ranged from .262 to .455, with all pairwise estimates remaining well below the commonly applied .85 threshold. The Fornell–Larcker and HTMT findings indicated that the five dimensions were related but empirically distinguishable, providing strong evidence of discriminant validity.

Higher-Order Confirmatory Factor Analysis

Following evaluation of the correlated five-factor model, a higher-order CFA was conducted to examine whether the five first-order dimensions could also be represented by an overarching Conscious Adaptive Teaching construct. In the hierarchical model, each of the 35 items continued to load on its designated first-order factor, while IA, PJ, AR, IF, and RE were specified as indicators of the second-order CAT factor.

The higher-order model demonstrated excellent fit to the data, $\chi^2(555) = 543.15$, $\chi^2/df = 0.98$, CFI = 1.000, TLI = 1.003, RMSEA = .000, and SRMR = .041. As with the first-order model, the TLI slightly above 1.00 and RMSEA of zero reflected a chi-square value below the model degrees of freedom and should not be interpreted as fit exceeding a theoretical maximum. The standardized second-order factor loadings were positive across all five dimensions, ranging from .499 to .691. See Table 15.

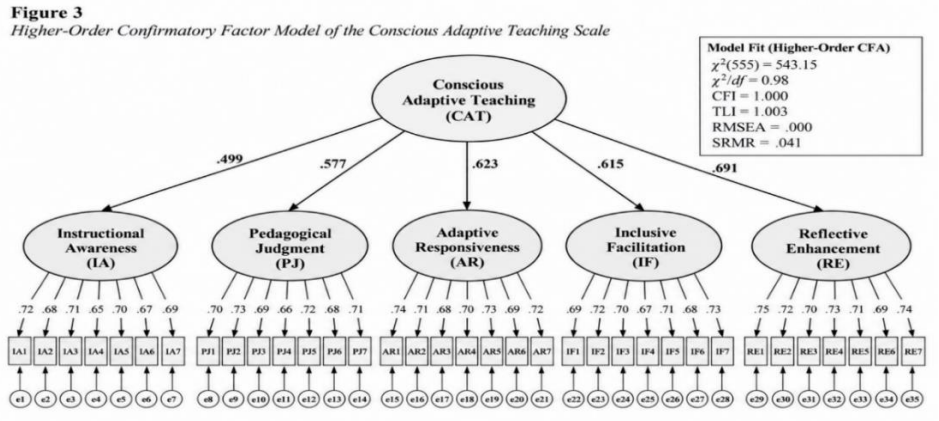
Table 15. Standardized Higher-Order Factor Loadings for the CATS

First-Order Dimension	Standardized Loading on CAT
Instructional Awareness	.499
Pedagogical Judgment	.577
Adaptive Responsiveness	.623
Inclusive Facilitation	.615
Reflective Enhancement	.691

Reflective Enhancement demonstrated the largest standardized relationship with the higher-order CAT construct (β = .691), followed by Adaptive Responsiveness (β = .623), Inclusive Facilitation (β = .615), Pedagogical Judgment (β = .577), and Instructional Awareness (β = .499). Thus, each first-order dimension contributed positively to the higher-order construct, although the magnitude of the relationships varied across dimensions.

Figure 3 presents the higher-order CFA model, with Conscious Adaptive Teaching (CAT) represented by five first-order dimensions. All dimensions loaded positively on CAT (β = .499–.691), with Reflective Enhancement showing the strongest loading (.691), followed by Adaptive Responsiveness (.623), Inclusive Facilitation (.615), Pedagogical Judgment (.577), and Instructional Awareness (.499). The findings support the proposed hierarchical structure of five distinct but related dimensions contributing to the broader CAT construct.

Figure 3
Higher-Order Confirmatory Factor Model of the Conscious Adaptive Teaching Scale



Note. CAT = Conscious Adaptive Teaching; IA = Instructional Awareness; PJ = Pedagogical Judgment; AR = Adaptive Responsiveness; IF = Inclusive Facilitation; RE = Reflective Enhancement. Values represent standardized factor loadings. The higher-order model was estimated using maximum likelihood in IBM SPSS AMOS. The model demonstrated excellent fit: $\chi^2(555) = 543.15$, $\chi^2/df = 0.98$, CFI = 1.000, TLI = 1.003, RMSEA = .000, and SRMR = .041. Results are based on the simulated dataset ($N = 350$) used for analytical demonstration.

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RQ3. To What Extent Does the Conscious Adaptive Teaching Scale Demonstrate Acceptable Reliability?

To address RQ3, the reliability of the Conscious Adaptive Teaching Scale (CATS) was evaluated using the full primary validation sample (**N = 350**). Internal consistency was examined using Cronbach's alpha (α), McDonald's omega (ω), composite reliability (CR), and corrected item-total correlations. The analyses were conducted for each of the five CATS dimensions and, where appropriate, for the overall 35-item scale.

Internal Consistency Reliability. Cronbach's alpha coefficients demonstrated strong internal consistency across all five CATS dimensions. Alpha values ranged from **.**857 to .884, exceeding the conventional criterion of .70. McDonald's omega produced nearly identical estimates, ranging from .857 to .884, providing converging evidence that the items within each dimension consistently measured their respective constructs.

Reflective Enhancement demonstrated the highest internal consistency (α = .884, ω = .884), followed by Inclusive Facilitation (α = .877, ω = .877), Pedagogical Judgment (α = .874, ω = .875), Adaptive Responsiveness (α = .862, ω = .862), and Instructional Awareness (α = .857, ω = .857). The close correspondence between alpha and omega estimates across all five dimensions indicates that the reliability findings were not dependent on a single internal-consistency coefficient.

Table 16. Reliability Estimates for the CATS Dimensions (N = 350)

Dimension	Items	Cronbach's α	McDonald's ω	CR	Corrected Item-Total *r* Range
Instructional Awareness (IA)	7	.857	.857	.857	.501–.674
Pedagogical Judgment (PJ)	7	.874	.875	.875	.535–.698
Adaptive Responsiveness (AR)	7	.862	.862	.862	.532–.670
Inclusive Facilitation (IF)	7	.877	.877	.877	.564–.708
Reflective Enhancement (RE)	**7**	**.884**	**.884**	**.884**	**.572–.712**

Note. α = Cronbach's alpha; ω = McDonald's omega; CR = composite reliability. Corrected item-total correlations represent the correlation between each item and the remaining items within its respective dimension.

Corrected Item-Total Correlations. Corrected item-total correlations were examined to determine the extent to which individual items were consistent with the remaining items within their respective dimensions. Across the 35 items, corrected item-total correlations ranged from .501 to .712. All coefficients exceeded .50, indicating that each item demonstrated a meaningful relationship with its intended dimension. The ranges were .501–.674 for Instructional Awareness, .535–.698 for Pedagogical Judgment, .532–.670 for Adaptive Responsiveness, .564–.708 for Inclusive Facilitation, and .572–.712 for Reflective Enhancement. These results provide additional evidence that all 35 items contributed adequately to the internal consistency of their respective dimensions.

The 35-item CATS demonstrated excellent overall internal consistency (α = .915; ω = .914), while composite reliability across the five dimensions ranged from .857 to .884. Item-deletion analyses provided no evidence for further item removal, as deleting any item failed to improve dimensional reliability. Notably, the weaker seventh items identified during EFA retained acceptable item-total correlations and did not reduce reliability, supporting their retention. Collectively, the findings demonstrate strong reliability for the overall CATS and its five dimensions.

V. DISCUSSION

The purpose of this study was to develop and provide initial psychometric validation of the Conscious Adaptive Teaching Scale (CATS), a multidimensional measure of Conscious Adaptive Teaching in higher education. Overall, the findings provide strong initial evidence for the factorial structure, construct validity, and reliability of the CATS and support its conceptualization through five dimensions: Instructional Awareness, Pedagogical Judgment, Adaptive Responsiveness, Inclusive Facilitation, and Reflective Enhancement.

For RQ1, exploratory factor analysis supported the proposed five-factor structure. The KMO statistic, Bartlett's test, scree plot, Horn's parallel analysis, and rotated factor solution converged in supporting five factors. Items demonstrated satisfactory primary loadings and communalities with minimal cross-loadings, supporting the theoretical distinction among the five dimensions. These findings suggest that Conscious Adaptive Teaching extends beyond observable instructional

flexibility to encompass interrelated cognitive, responsive, inclusive, and reflective processes underlying adaptive instructional decision-making.

For RQ2, confirmatory analyses provided additional support for the proposed measurement structure. Composite reliability was strong across dimensions, while AVE supported convergent validity for three dimensions and approached the conventional .50 criterion for Instructional Awareness and Adaptive Responsiveness. Discriminant validity was supported by the Fornell–Larcker criterion and HTMT, indicating that the dimensions were related yet empirically distinguishable. Importantly, the higher-order findings provide preliminary empirical support for the CAT framework's central proposition that Instructional Awareness, Pedagogical Judgment, Adaptive Responsiveness, Inclusive Facilitation, and Reflective Enhancement are distinguishable yet interconnected manifestations of a broader consciously regulated teaching process.

For RQ3, reliability analyses demonstrated strong internal consistency across the five dimensions and overall CATS. Cronbach's alpha, McDonald's omega, composite reliability, and corrected item-total correlations indicated that the retained items consistently measured their intended dimensions. Together with the factor and validity findings, these results support the CATS as a promising measure for research on adaptive instructional decision-making.

CATS operationalizes Conscious Adaptive Teaching beyond observable teaching behaviors by incorporating the cognitive and reflective processes that guide instructional adaptation. The instrument provides a foundation for research examining faculty development, instructional effectiveness, inclusive practice, and adaptive teaching in increasingly diverse and technology-enhanced learning environments. Independent replication, measurement-invariance testing, and criterion and predictive validity studies are needed to further establish its generalizability and practical utility.

Theoretical Implications

This study advances the literature by operationalizing Conscious Adaptive Teaching as a measurable construct. Although the Conscious Adaptive Teaching framework proposed five interrelated dimensions, Instructional Awareness, Pedagogical Judgment, Adaptive Responsiveness, Inclusive Facilitation, and Reflective Enhancement, no validated instrument previously existed to assess these constructs. The development and initial validation of the CATS provides a psychometrically supported measure for empirical investigation across diverse educational contexts. The findings also extend existing theories of adaptive teaching by emphasizing conscious cognitive regulation as a central component of instructional decision-making. Rather than viewing adaptive teaching solely as instructional flexibility, the CATS conceptualizes it as a multidimensional capability integrating awareness, pedagogical judgment, responsiveness, inclusion, and reflective practice. The higher-order confirmatory factor analysis further supports this conceptualization by demonstrating that the five dimensions function collectively as indicators of a single higher-order latent construct.

Finally, the CATS establishes a measurement foundation for future theory testing. Researchers can now examine the antecedents, outcomes, and predictive validity of Conscious Adaptive Teaching, evaluate the stability of the higher-order model across educational settings, and further refine the theoretical propositions of the Conscious Adaptive Teaching framework

Practical Implications

The Conscious Adaptive Teaching Scale (CATS) provides a structured measure for assessing adaptive teaching across five dimensions: Instructional Awareness, Pedagogical Judgment, Adaptive Responsiveness, Inclusive Facilitation, and Reflective Enhancement. The instrument has potential applications in faculty self-assessment, professional development, instructional coaching, and teaching-improvement initiatives, particularly in diverse and technology-enhanced learning environments. It also provides researchers with a standardized measure for investigating relationships between Conscious Adaptive Teaching and outcomes such as teaching effectiveness, student engagement, instructional innovation, and inclusive practice. For institutions, the CATS may complement traditional approaches to evaluating teaching by providing a multidimensional perspective on adaptive instructional decision-making. Given its current stage of validation, the CATS is particularly well suited to research and formative developmental applications, while independent replication and additional validity evidence will support consideration of broader evaluative uses.

Limitations and Future Research

Several limitations warrant consideration. EFA and CFA used the same sample (N = 350), limiting independent cross-validation; purposive sampling and self-report may constrain generalizability; and the cross-sectional design precluded

assessment of temporal stability. AVE for Instructional Awareness and Adaptive Responsiveness was slightly below .50 despite strong composite reliability. Future studies should conduct independent CFA, test–retest reliability, measurement invariance, and criterion, incremental, and predictive validity across diverse populations and contexts. Examining whether CATS predicts outcomes such as student engagement, teaching effectiveness, adaptability, belonging, and learning would further establish its broader and practical validity.

VI. CONCLUSION

The purpose of this study was to develop and provide initial validation of the Conscious Adaptive Teaching Scale (CATS), a multidimensional instrument designed to measure Conscious Adaptive Teaching in higher education. The findings provided support for the proposed five-factor structure comprising Instructional Awareness, Pedagogical Judgment, Adaptive Responsiveness, Inclusive Facilitation, and Reflective Enhancement. Evidence from factorial structure, construct validity, higher-order modeling, and reliability provided strong initial psychometric support for the CATS.

By operationalizing Conscious Adaptive Teaching as a measurable construct, this study extends the theoretical framework into empirical research and provides educators and researchers with a standardized instrument for investigating adaptive teaching practices. The higher-order measurement model further supports the conceptualization of Conscious Adaptive Teaching as an integrated, multidimensional capability that underpins effective instructional decision-making.

As higher education continues to evolve in response to increasing learner diversity, technological innovation, and the integration of artificial intelligence, the ability to assess and strengthen adaptive teaching has become increasingly important. The CATS provides a foundation for future research, faculty development, and evidence-based instructional improvement, contributing to a deeper understanding of adaptive teaching in contemporary higher education.

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