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Evaluation of the Learning Quality of the Agricultural Industrial Technology Study Program Using Customer Satisfaction Index (CSI) And Importance-Performance Analysis (IPA)

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ABSTRACT

Purpose: This study analyzes the learning process quality in the Agricultural Industrial Technology Program at Universitas Negeri Makassar by evaluating satisfaction, analyzing gaps, and mapping priority attributes to provide data-driven management recommendations. **Methods:** This descriptive quantitative survey involved 121 active students, split into pilot and main groups. Content validity was verified using Aiken's V with 5 experts. Construct validity was tested via Confirmatory Factor Analysis (CFA) in JASP, and reliability via Cronbach's Alpha. Data analysis integrated the Customer Satisfaction Index (CSI) and Importance-Performance Analysis (IPA). **Findings:** Aiken's V confirmed content validity ($V \geq 0.87$). CFA eliminated 5 weak items, leaving 40 valid items with excellent reliability (alpha = 0.958). Indicator CSI scores reflected "Satisfied" and "Very Satisfied" categories (70.08%–84.40%). The grand mean of performance ($X = 3.99$) fell below importance ($Y = 4.46$), yielding a -0.47 gap. The IPA matrix identified two critical Quadrant I (Top Priority) attributes: lab staff responsiveness to technical glitches (Item 18) and flexible personal tutoring for struggling students (Item 34). **Research Implications:** These findings direct study program management to bypass high-cost overhauls, reallocating those resources to optimize laboratory staff responsiveness and more personalized student mentoring. Additionally, the CSI baseline indicates that student satisfaction remains anchored by strong pedagogy, proving that interventions must target specific technical and administrative bottlenecks. **Originality:** This study hybridizes the SERVQUAL framework with the latest National Higher Education Standards (Permendiktisaintek No. 39/2025), statistically reinforced by CFA to map academic dynamics in a developing engineering program.

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INTRODUCTION

The higher education in Indonesia is currently undergoing a structural transformation, in which institutions face mounting pressure to develop professionals who are both highly competent and deeply adaptable. In the realm of educational quality assurance, true institutional merit is no longer measured solely by bureaucratic checklists or administrative compliance; rather, it lies in the actual, transformative learning experiences students have on a daily basis (Harvey & Green, 1993; Welzant et al., 2011). Because of this shift, managing an instructional environment that actively mirrors student needs and expectations has become a core requirement for sound university governance. Modern educational evaluation demands that we look closely at the student journey, evaluating classroom pedagogical delivery, practical skill acquisition, and infrastructure reliability as interconnected parts of a shared academic ecosystem (Hill et al., 2003).

This operational responsibility becomes even more pronounced when universities step up to bridge the gap between abstract scientific theories and industrial applications, especially in specialized areas like agro-industrial technology. Responding to these specific regional and industry demands, the Faculty of Engineering at Universitas Negeri Makassar took the bold step of establishing the undergraduate program in Agricultural Industrial Technology

(Teknologi Industri Pertanian - TIP). Designed to prepare future engineers to manage post-harvest processing, bio-system efficiency, and industrial agricultural management, the program represents a crucial academic addition. However, because the department is still in its foundational phase, it faces a unique challenge: mapping exactly how its pioneer cohorts perceive the quality and delivery of its training architecture.

In theory, running a successful engineering program requires an absolute balance between a forward-looking curriculum, expert teaching faculty, and top-tier physical infrastructure. In reality, early-stage academic programs are almost always forced to compromise due to limited technical resources, raising valid worries about laboratory capacity, instrument availability, and technical support. When a wide gap opens between the advanced theories taught in lectures and the actual tools available for hands-on experiments, unresolved physical infrastructure constraints pose severe operational risks to technical skill acquisition, requiring precise diagnostic tracking to determine their actual psychological and behavioral toll on the pioneer student body. This friction is common, but it must be managed carefully to protect the student experience.

While the literature frequently explores student satisfaction in long-standing university departments, newly established study programs present a completely different set of academic dynamics (Setianah, 2023). Extensive research on higher education quality has traditionally relied on generic, macro-level compliance surveys to map student satisfaction across broad institutional dimensions (Nazari-Shirkouhi et al., 2020; Parahoo et al., 2016). For instance, standard evaluations often treat educational service quality as a rigid, uniform construct, assuming that student expectations and service encounters are identical across all academic settings without accounting for faculty-specific contexts (Voss et al., 2007). Conversely, while specialized engineering education literature highlights the critical pedagogical role of hands-on experimental assets, existing frameworks heavily focus on established technical institutes with stable operational histories, thereby overlooking how pioneering cohorts navigate the high operational costs and physical resource constraints typical of early-stage training environments (Ma & Nickerson, 2006). This methodological uniformity creates a critical blind spot: past studies fail to critically synthesize the immediate, department-specific frictions occurring inside nascent technical classrooms and developing laboratories, leaving administrators without localized data to manage early-stage structural limitations.

Furthermore, the urgency of this diagnostic approach is amplified by the evolving regulatory landscape of Indonesian higher education, specifically under the latest national standards (Permendiktisaintek No. 39, 2025). These guidelines mandate that developing programs must demonstrate not only structural compliance but also operational agility in their internal quality assurance systems (SPMI). Historically, service quality assessments in higher education have been criticized for relying on unvalidated instruments that overlook the unique features of the target student body (Retnawati, 2016). A critical synthesis of previous educational evaluation models reveals a systemic dependency on applying the traditional SERVQUAL scale arbitrarily; most past frameworks completely bypass the rigorous pre-requisite psychometric testing needed to verify if standard service dimensions remain stable when transplanted into a highly technical engineering context (Azwar, 2021; Hair et al., 2019). This omission often results in misaligned diagnostic tools that generate superficial feedback, failing to capture the true operational realities of a developing technical department. Therefore, the central problem investigated in this study is the lack of an empirically validated, micro-level diagnostic framework capable of isolating structural service bottlenecks within a newly established engineering program under tight budgetary constraints. To overcome this limitation, this study structurally reinforces the classic SERVQUAL dimensions by integrating rigorous psychometric validation specifically through expert consensus indexing and Confirmatory Factor Analysis (CFA) ensuring that the underlying measurement model is entirely valid and reliable before processing empirical field data.

Deploying regular, highly diagnostic quality evaluations serves as an early warning system, helping administrators pinpoint where day-to-day operations fall short of student expectations. Grounding this internal assessment within empirical metrics helps the program meet its internal quality benchmarks (SPMI) while ensuring it stays fully prepared for formal national accreditation cycles (Amanah et al., 2022; Mujahidin et al., 2021). By adapting classic SERVQUAL dimensions to match contemporary Indonesian educational guidelines, this study moves past surface-level feedback. Instead, we use an integrated Customer Satisfaction Index (CSI) and Importance-Performance Analysis (IPA) framework to uncover clear, reliable strategic paths for targeted program improvement (O'Neill & Palmer, 2004; Parasuraman et al., 1988; Tjiptono, 2019; Wibisono, 2019).

Confronted with these institutional imperatives, this study aims to comprehensively evaluate the quality of the learning process in the TIP Study Program at Universitas Negeri Makassar. Specifically, this research sets out to determine aggregate student satisfaction baselines using the CSI algorithm, analyze the magnitude of existing performance-expectation gaps, and strategically map critical instructional attributes using the IPA matrix to guide immediate administrative interventions. By bridging the gap between rigorous psychometric validation and practical resource management, this study provides a highly replicable, data-driven blueprint for newly established departments striving to optimize student satisfaction and achieve structural accreditation excellence under tight budgetary constraints.

METHOD

To systematically explore the student satisfaction, this study used a structured, descriptive quantitative survey design. This survey approach was chosen because it excels at translating subjective human perceptions into clear, numerical data points, allowing for an objective assesment of service quality characteristics without disrupting the ongoing academic routine (Maidiana, 2021). The entire research wa conducted over three months within the Agricultural Industrial Technology Study Program, Department of Agricultural Technology, Faculty of Engineering, Universitas Negeri Makassar, progressing deliberately from tool validation through field collection to final statistical modeling.

The study focused on the program's pioneer cohorts, drawing from a total pool of 121 active students enrolled in the official university portal. A non-probability purposive sampling technique was employed to select active undergraduate students from the 2024 and 2025 pioneer cohorts of the Agricultural Industrial Technology Study Program, Faculty of Engineering, Universitas Negeri Makassar (UNM), strictly filtering by their verified active status and routine Study Plan Card completion. Through this framework, the cohorts were split into two functional groups: a subset of 55 students participated in an initial pilot study to assess the survey's psychometric properties, while the remaining 66 students formed the primary sample for the final service quality evaluation. This targeted selection ensures that all participants had accumulated sufficient, continuous exposure to the department's specialized agricultural Industrial curriculum and laboratory workflows to yield highly diagnostic evaluation data.

Data was collected through a dual-response digital questionnaire built on the five foundational pillars of SERVQUAL (Tangibles, Reliability, Responsiveness, Assurance, and Empathy) carefully adapted to fit national university standards (Parasuraman et al., 1988). For every single item, students were asked to give two distinct ratings on a 5-point Likert scale: first, evaluating the actual Performance they experience every day, and second, stating the level of Importance or expectation they hold for that item. The instrument underwent a thorough two-tier validation process to ensure data integrity. Initially, content validity was verified by a panel of 5 academic experts, whose independent scores were processed through Aiken's V formula to hit a target logical threshold of V ≥ 0.87 (Aiken, 1985; Hendryadi, 2017; Patahuddin et al., 2025).

To evaluate the psychometric properties of the initial 45-item instrument during the pilot study phase ($N = 55$), Confirmatory Factor Analysis (CFA) was systematically applied. The analysis was executed through separate and independent first-order CFAs for each individual latent dimension within the JASP software application to test construct validity. Since each sub-scale was restricted to approximately 9 items, this structural evaluation maintained an item-to-respondent ratio of $1{:}\,6.11$. This configuration strictly satisfies the statistical requirements proposed by Hair et al. (2019), which state that an item-to-sample ratio exceeding the minimum threshold of 1:5 is entirely adequate for localized parameter verification and item reduction during the early stages of instrument development. Model adequacy and item retention were verified by checking global fit indices, specifically Root Mean Square Error of Approximation (RMSEA < 0.08), Comparative Fit Index (CFI > 0.90), and Tucker-Lewis Index (TLI > 0.90), alongside individual factor loadings (≥ 0.50) (Goss-Sampson, 2019; Hair et al., 2019; Tschense & Wallot, 2022).

Internal reliability was then checked using Cronbach's Alpha to ensure index consistency (George & Mallery, 2003; Retnawati, 2016). To anchor the evaluation process mathematically, the primary dataset was processed through a strict four-stage Customer Satisfaction Index (CSI) algorithm to derive aggregate satisfaction metrics (Tjiptono, 2019; Wijaya, 2017):

1. First, the Mean Importance Score (MIS_i) and Mean Performance Score (MPS_i) were computed for each individual quality attribute: $MIS_i = \frac{\sum_{j=1}^{n} Y_{ij}}{n}$; $MPS_i = \frac{\sum_{j=1}^{n} X_{ij}}{n}$ where X_{ij} represents the performance score given by respondent j to item i, Y_{ij} is the importance score given by respondent j to item i, and n represents the total main sample size ($n = 61$).
2. Next, the Weight Factor (WF_i) was extracted for each item to outline its relative value relative to the total expectation matrix: $WF_i = \left(\frac{MIS_i}{\sum_{i=1}^{k} MIS_i}\right) \times 100\%$ Where k signifies the total number of finalized valid elements across the scale ($k = 40$).
3. The Weight Score (WS_i) was then established by interacting the empirical performance mean with its calculated structural weight factor: $WS_i = MPS_i \times WF_i$

4. Finally, the comprehensive Customer Satisfaction Index (CSI) percentage was assembled: $\mathrm{CSI} = \left(\frac{\sum_{i=1}^{k} ws_i}{\mathrm{HS}}\right) \times 100\%$ Where *HS* reflects the highest possible mark on the implemented measurement continuum (*HS* = 5).

Concurrently, the architectural priorities were determined using Importance-Performance Analysis (IPA) quadrant mapping. To group these variables into an actionable Cartesian plot, the exact cross-sectional axes divided the four quadrants using the cross-dimensional dataset grand means (Miranda et al., 2010; Sadika et al., 2023): $\bar{\bar{X}} = \frac{\sum_{i=1}^{k} \bar{X}_i}{k}$; $\bar{\bar{Y}} = \frac{\sum_{i=1}^{k} \bar{Y}_i}{k}$

These calculated intersections ($\bar{\bar{X}}$, $\bar{\bar{Y}}$) systematically divided the analytical matrix into four specific strategic quadrants (Quadrant I: Concentrate Here, Quadrant II: Keep Up the Good Work, Quadrant III: Low Priority, and Quadrant IV: Possible Overkill), establishing a reliable diagnostic view of the program's operations.

RESULTS

The initial development phase produced an assessment tool with 45 operational items. Processing the expert panel's ratings through Aiken's V revealed excellent conceptual agreement, with individual item indices landing between 0.87 and 1.00 ($V \geq 0.87$) and yielding a strong cumulative content validity mean of 0.99, confirming that the tool was conceptually sound (Aiken, 1985). With content validity firmly established, we then shifted our focus to evaluating the instrument's structural integrity. Under our established statistical criteria, an item achieves construct validity only when it satisfies the required fit indices: RMSEA < 0.08, CFI > 0.90, and TLI > 0.90, paired with an individual factor loading of ≥ 0.5. Evaluating the initial pool of 45 statements revealed that 5 items failed to meet these baseline requirements, leading to their immediate elimination from the scale. Consequently, this diagnostic pass left 40 highly refined statements that proved to be structurally sound and fully dependable for mapping importance and performance levels. The global CFA model fit outcomes for this revised 40-item instrument are systematically detailed in Table 1. A reliability check on these 40 refined items yielded a highly stable Cronbach's Alpha coefficient of 0.958 (95% CI: 0.941–0.971). This high mark confirms excellent internal consistency, proving the survey instrument was ready for full deployment (George & Mallery, 2003). The final validated instrument is presented in Table 3.

Table 1. CFA Fit Indices of the Finalized Service Quality Instrument

Service Quality Dimension	RMSEA (< 0.08)	CFI (> 0.90)	TLI (> 0.90)	Classification
Tangibles	0.068	0.973	0.949	Good Fit
Reliability	0.000	1.000	1.002	Good Fit
Responsiveness	0.075	0.974	0.956	Good Fit
Assurance	0.074	0.979	0.965	Good Fit
Empathy	0.067	0.983	0.974	Good Fit

Table 2. Factor Loading Values of the CFA Analysis Using JASP

Dimension	Indicator	Initial Item Nu.	Factor Loading	Status
Tangibles	Availability of Technical	1	0.762	Good Fit
	Infrastructure	3	0.909	Good Fit
	Conducive Learning Environment	5	0.737	Good Fit
		6	0.702	Good Fit
	Educational Information Technology	7	0.508	Good Fit
		8	0.662	Good Fit
		9	0.695	Good Fit
Reliability	Implementation of the Learning	10	0.762	Good Fit
	Process	11	0.855	Good Fit
		12	0.696	Good Fit
	Assessment Standards: Transparency	13	0.812	Good Fit
		14	0.817	Good Fit
	Learning Outcomes Assessment:	16	0.715	Good Fit
	Formative	17	0.844	Good Fit
		18	0.827	Good Fit
Responsiveness		19	0.765	Good Fit

Dimension	Indicator	Initial Item Nu.	Factor Loading	Status
	Process Standards: Instructional	20	0.865	Good Fit
	Interactivity	21	0.635	Good Fit
	Academic Administrative Services	22	0.696	Good Fit
		23	0.728	Good Fit
		24	0.78	Good Fit
	Mentoring Communication	25	0.748	Good Fit
		26	0.719	Good Fit
Assurance	Graduate Competency Standards	28	0.98	Good Fit
		29	0.744	Good Fit
	Educator Competency	31	0.841	Good Fit
		32	0.729	Good Fit
		33	0.877	Good Fit
	Safety of the Learning Environment	34	0.69	Good Fit
		35	0.806	Good Fit
		36	0.635	Good Fit
Empathy	Inclusive Learning Process	37	0.744	Good Fit
		38	0.786	Good Fit
		39	0.804	Good Fit
	Student Welfare and Care	40	0.842	Good Fit
		41	0.872	Good Fit
		42	0.848	Good Fit
	Friendly Attitude & Harmonious	43	0.825	Good Fit
	Atmosphere	44	0.875	Good Fit
		45	0.687	Good Fit

Table 3. Final Configuration of the Validated Service Quality Instrument

Indicator	Final Item Nu.	Questionnaire Statement
		Tangibles Dimension
Technical Infrastructure & Equipment Availability	1	Laboratory equipment is adequate for all students to use during practical sessions.
	2	Consumables for laboratory practical sessions are available when needed.
Conducive Learning Environment	3	Classroom temperature and lighting support learning comfort.
	4	Public facilities, such as restrooms and prayer rooms, are clean and well-maintained.
Instructional Information Technology	5	The online learning platform (LMS) is easily accessible to students.
	6	The campus internet connection is stable enough to support academic activities.
	7	Digital learning materials are easily accessible and comprehensible.
		Reliability Dimension
Execution of the Learning Process	8	Lecturers consistently deliver materials in accordance with the Semester Learning Plan (RPS).
	9	Learning materials are delivered in a systematic and logical sequence.
	10	Lectures begin and end punctually according to the schedule.
Assessment Standards: Transparency	11	Assessment criteria are transparently explained at the beginning of the course.
	12	Lecturers grade fairly based on explicit and clear criteria.
Learning Outcome Assessment: Formative	13	Lecturers provide corrections and feedback on student assignments.
	14	Lecturers provide constructive feedback to improve student learning outcomes.
	15	Routine evaluations effectively help students identify their academic weaknesses.

Indicator	Final Item Nu.	Questionnaire Statement
		Responsiveness Dimension
Process Standards: Instructional Interactivity	16	Lecturers respond promptly to student questions during class sessions.
	17	Lecturers quickly assist students who encounter difficulties understanding the material.
	18	Laboratory staff immediately assist when technical issues occur during practicals.
Academic Administrative Services	19	Academic administrative services, such as document and letter processing, are handled efficiently.
	20	Information regarding class schedule modifications is communicated promptly.
	21	Student complaints regarding services are addressed swiftly by the study program management.
Mentoring & Advisory Communication	22	Lecturers are easily reachable for personal academic consultation.
	23	Lecturers respond to undergraduate thesis progress updates within a short timeframe.
		Assurance Dimension
Graduate Competency Standards	24	Course materials are highly relevant to the current needs of the agricultural industry.
	25	Practical technical skills training in the laboratory enhances student self-confidence.
Educator Competency	26	Lecturers demonstrate a profound mastery of their respective fields of study.
	27	Lecturers' explanations are convincing, logical, and easy to comprehend.
	28	Lecturers maintain professional authority and ethics during teaching.
Safety of the Learning Environment	29	The learning environment within the TIP study program feels completely safe for students.
	30	Laboratory occupational safety procedures are thoroughly explained to students.
	31	The learning process takes place in a comfortable atmosphere of mutual respect.
		Empathy Dimension
Inclusive Learning Process	32	Lecturers demonstrate an understanding of students' diverse learning constraints.
	33	The study program management provides fair and equitable treatment to all students.
	34	Students experiencing academic difficulties receive personalized guidance.
Student Welfare & Care	35	Lecturers display genuine concern for students' health and well-being.
	36	Lecturers provide adequate support to students facing personal or academic hardships.
	37	Study program leadership allocates sufficient time to listen to student constraints.
Friendly Demeanor & Familial Atmosphere	38	Faculty and administrative staff greet students warmly and politely.
	39	Diverse opinions and perspectives during classroom discussions are well-respected.
	40	Relationships among the academic community of the TIP study program are close and harmonious.

Moving to the primary evaluation dataset, out of the total pool of 66 targeted primary subjects, 5 students were absent. Consequently, the final sample comprised 61 respondents, representing a 92% response rate. Descriptive calculations showed a cumulative mean performance score (X) of 3.99 against an importance expectation score (Y) of

4.46. Subtracting performance from expectation revealed a distinct negative quality gap of -0.47, indicating that day-to-day operational realities generally fell short of ideal student expectations.

Despite this gap, the overall student satisfaction level calculated using the Customer Satisfaction Index (CSI) formula reached a respectable level, ranging from 70.08% to 84.40%, as shown in Table 3. According to established satisfaction brackets, the program's overall instructional quality falls comfortably within the "Satisfied" range. Looking closer at specific educational categories reveals a varied picture: 7 indicators (46.67%) achieved "Very Satisfied" status, while 8 indicators (53.33%) fell into the standard "Satisfied" range. The weakest categories were Educational Information Technology (CSI: 70.08%), Technical Equipment Infrastructure (CSI: 71.80%), and Academic Administration Services (CSI: 75.67%).

Table 4. Recapitulation of Customer Satisfaction Index (CSI) Scores and Criteria Across SERVQUAL Dimensions

Dimension	Indicator	CSI	Criteria
Tangibles	Technical Infrastructure & Equipment Availability	71.80%	Satisfied
	Conducive Learning Environment	84.40%	Very Satisfied
	Educational Information Technology	70.08%	Satisfied
Reliability	Implementation of the Learning Process	82.89%	Very Satisfied
	Assessment Standards: Transparency	83.20%	Very Satisfied
	Student Learning Assessment: Formative	79.56%	Satisfied
Responsiveness	Process Standards: Instructional Interactivity	83.50%	Very Satisfied
	Academic Administration Services	75.67%	Satisfied
	Mentoring & Guidance Communication	78.19%	Satisfied
Assurance	Graduate Competency Standards	83.62%	Very Satisfied
	Educator Competency	83.43%	Very Satisfied
	Learning Environment Safety	82.00%	Very Satisfied
Empathy	Inclusive Learning Process	79.25%	Satisfied
	Student Welfare and Care for Student Conditions	80.69%	Satisfied
	Friendly Attitude & Familial Atmosphere	80.75%	Satisfied

To prioritize action items, all 40 valid attributes were mapped onto an Importance-Performance Analysis (IPA) Cartesian plot. The dividing axes were placed precisely at the dataset's grand means: Importance (Y = 4.46) and Performance (X = 3.99). The distribution of 40 learning quality statements into the Importance-Performance Analysis (IPA) Cartesian Matrix can be seen in the following Figure 1.

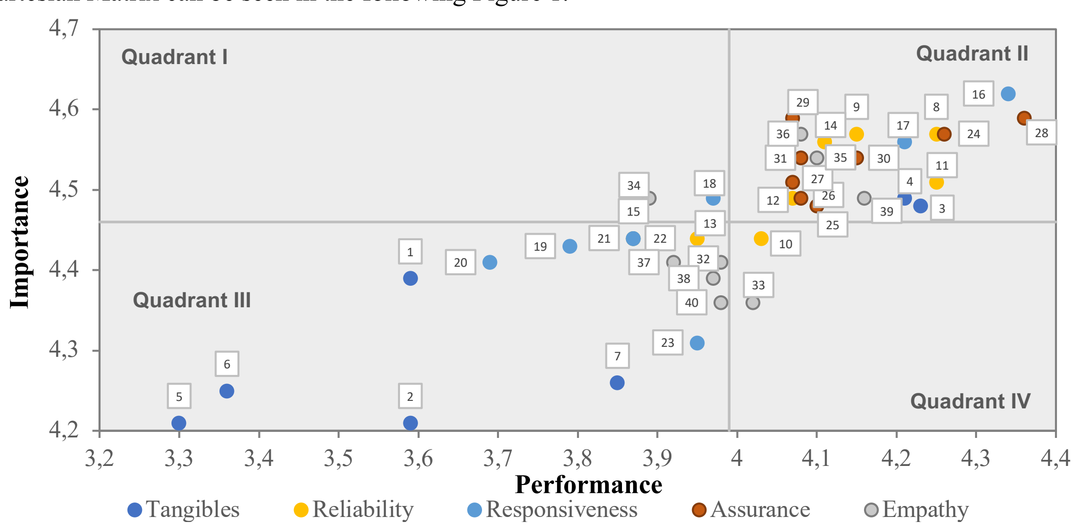

Figure 1. Importance-Performance Analysis (IPA) Cartesian Matrix

DISCUSSION

To establish a scientifically sound foundation, the initial 45-item questionnaire was evaluated by a localized 5-expert panel comprising educational evaluation specialists, a linguist, the Head of the Study Program, and internal Quality Assurance representatives from the Agricultural Industrial Technology program. Based on Aiken's V formula for 5 raters and a 4-point response scale, the required consensus threshold was set at $V \geq 0.87$(Aiken, 1985). The empirical analysis showed that every single item achieved or exceeded this benchmark, yielding a strong cumulative content validity mean of 0.99 and confirming that the questionnaire successfully translated national mandates (Permendiktisaintek No. 39, 2025) into highly relatable indicators of daily student learning dynamics. This initial screening offers a crucial logical check to ensure field readiness (Mardapi, 2017), validating Hendryadi (2017) assertion that content validity is the most fundamental first step before attempting advanced statistical operations. Furthermore, by directly involving local stakeholders who understand localized academic governance as recommended by Pratiwi & Kusumah (2024), this collaborative design bypassed the rigidity of generic external evaluations (Setianah, 2023) and aligned perfectly with the findings of Patahuddin et al. (2025), who demonstrated that quantitative expert consensus mapping via Aiken's indices provides an exceptionally objective foundation before conducting empirical trials.

Following qualitative screening, the instrument's structural dimensions were empirically tested through Confirmatory Factor Analysis (CFA) in JASP to assess how accurately the items captured the latent dimensions of learning quality. To achieve an acceptable global model fit, each dimension was required to satisfy strict psychometric benchmarks: RMSEA < 0.08, CFI > 0.90, and TLI > 0.90, alongside individual item factor loadings of ≥ 0.5. The initial diagnostic pass over the 45 statements indicated that 5 items fell short of these criteria and were eliminated. Re-running the CFA model with the remaining 40 items yielded excellent global fit indices (RMSEA < 0.08, CFI > 0.90, TLI > 0.90) and individual factor loadings well above 0.50, confirming the instrument's structural validity and readiness to measure importance and performance levels. This successful model re-specification mirrors protocols by Azwar (2021), who noted that construct validation ensures theoretical concepts accurately translate into empirical data patterns, as well as the practical measurement adjustments described by Retnawati (2016), where removing items that display unexpected error variances is essential to align the tool with the true characteristics of the target sample.

The finalized 40-item scale was subsequently evaluated for internal consistency using Cronbach's Alpha via JASP to ensure it could gather stable, dependable data across field deployments. Data from the 51 pilot respondents yielded a remarkably high reliability coefficient of 0.958, comfortably placing the questionnaire in the "Excellent" classification, as it far exceeded the conventional 0.70 threshold. From a theoretical perspective, this high value indicates a strong, cohesive internal structure among the statements, suggesting that the scale carries negligible measurement error and that all items work together to measure the same target construct (Azwar, 2021).

The Customer Satisfaction Index (CSI) analysis was completed across 15 distinct instructional indicators, with the comprehensive distribution detailed in Table 3. The empirical results demonstrate a highly favorable distribution split across two positive satisfaction thresholds: "Very Satisfied" and "Satisfied". Approximately 46.67% (7 indicators) achieved the "Very Satisfied" standard, confirming that the instructional processes within the Agricultural Industrial Technology (TIP) program consistently meet the highest student expectations. The remaining 53.33% (8 indicators) fell into the "Satisfied" classification, indicating that while the overall learning environment is highly functional and comfortable, a clear baseline for ongoing refinement remains. Mathematically, because every indicator score remains comfortably above the baseline satisfaction threshold, these findings suggest that the TIP program maintains a healthy trajectory toward Continuous Quality Improvement (Sallis, 2014), demonstrating its capability to consistently satisfy core service specifications during its foundational phase.

Conversely, a closer look at Table 3 highlights three trailing attributes that, although within the "Satisfied" bracket, pinpoint clear operational gaps that warrant targeted administrative evaluation. The Educational Information Technology indicator marked the lowest satisfaction level (CSI: 70.08%), indicating that students experience insufficient digital support, unstable Wi-Fi connections, and rigid LMS interfaces, which limit their interaction with industrial simulation tools and modern research databases. This digital gap echoes the concept of functional adequacy introduced by Welzant et al. (2011), which emphasizes that modern higher education suffers functional deficiencies if its IT infrastructure falls out of sync with the digital industrial era. Following closely is the Technical Equipment Infrastructure indicator (CSI: 71.80%), indicating that limited or aging laboratory apparatuses limit hands-on engineering exercises a common logistical hurdle for newly established departments navigating long-term budget constraints. Under the classic SERVQUAL framework by Parasuraman et al. (1988), such physical infrastructure gaps in the tangibles dimension linearly impose early downward pressures on overall consumer satisfaction. Lastly, Academic Administration Services scored 75.67%, indicating that students expect less convoluted, highly responsive, and digitized bureaucratic workflows. Ultimately, a clear systemic pattern emerges: student grievances are entirely confined to physical infrastructure and administrative systems, in stark contrast to with non-physical dimensions, such as a supportive learning environment and high lecturer teaching competencies, which earned exceptional satisfaction marks.

A closer look at the IPA matrix reveals two critical operational bottlenecks in Quadrant I (Concentrate Here). These are Item 18 ("Laboratory staff are immediately available to assist with technical issues during practical exercises") and Item 34 ("Students experiencing academic difficulties receive personalized guidance"). In engineering fields, hands-on training spanning food chemistry analysis, bioprocess applications, and post-harvest engineering forms the absolute spine of the curriculum (Aslamiyah, 2023; Latifah et al., 2021). Students are regularly tasked with operating delicate, complex instruments. When technical issues arise in the middle of a timed lab trial, a delayed response from support staff can ruin an entire experiment and waste valuable learning time. On the flip side, Item 34 draws attention to a lack of flexible, one-on-one academic mentoring outside formal class times. The heavily quantitative curriculum, rich in mass transfer models and industrial calculus applications, creates a natural need for targeted remedial guidance to prevent struggling students from falling permanently behind.

Attributes situated within Quadrant II represent the primary strengths of the TIP FT-UNM study program, seamlessly combining high student importance ratings (above 4.46) with highly satisfactory performance delivery (above 3.99). These indicators directly align with elevated Customer Satisfaction Index (CSI) metrics within the "Very Satisfied" range, specifically for a Conducive Learning Environment (84.40%), Graduate Competency Standards (83.62%), Instructional Interactivity (83.50%), Educator Competency (83.43%), and Assessment Standards transparency (83.20%). These robust scores demonstrate that the teaching faculty effectively bypass rigid, unidirectional lecturing by fostering interactive discussions and objective grading workflows. This pattern closely aligns with Syahrul (2015), who argues that transparent evaluations enhance student trust and academic confidence.

Descriptively, this high pedagogical quality stands in stark contrast to the infrastructure deficits mapped in Quadrant III and the staff responsiveness limitations in Quadrant I. While this study does not statistically model direct psychological mediation channels, this descriptive contrast can be conceptually interpreted through academic adjustment principles (Sappaile & Pahrijal, 2023). Within this paradigm, strong faculty dedication and active learning engagement serve as key institutional factors that effectively counterbalance early-stage laboratory resource

Meanwhile, attributes landing in Quadrant III (Low Priority) mostly involve secondary amenities and general digital tools, such as campus Wi-Fi stability, restroom maintenance, and standard portal interfaces (item 2, 5, and 6). Performance here was rated average, but students also reported low expectations for these items. Students are highly functional and pragmatic; they prioritize core instructional stability over general campus aesthetics, as long as their primary lectures and lab modules run without major errors. This distribution, combined with Quadrant IV's over-engineered areas (such as rigid adherence to weekly lesson structures in Item 10), provides clear, actionable advice for resource reallocation (Juran, 1998; Sallis, 2014). Program administrators do not need to stretch tight budgets on macro-facility aesthetic overhauls in Quadrant III. Instead, operational funding and faculty focus should be directed right at fixing the two critical gaps in Quadrant I: training laboratory assistants for immediate technical response and formalizing accessible faculty office hours for personal student mentoring (Miranda et al., 2010; Nazari-Shirkouhi et al., 2020).

Acknowledging the boundaries of this evaluative study is critical for accurate interpretation. The primary limitation lies in the small, localized sample size ($N = 66$ for the primary evaluation), which was strictly restricted to the 2024 and 2025 pioneer cohorts via non-probability purposive sampling. Consequently, this introduces a potential sampling bias, as the findings reflect the highly specific lived experiences of a pioneering student body navigating an emerging curriculum under tight initial budgets, meaning the results cannot be generalized to larger, well-established engineering departments. Furthermore, because this study relies entirely on self-reported survey data, it captures student perceptions at a single point in time rather than tracking longitudinal changes in satisfaction. Future research should expand the sampling framework to include cross-institutional comparisons and integrate qualitative focus group discussions to triangulate these psychometric trends with deeper behavioral insights.

CONCLUSION

This study successfully addresses all stated research objectives by evaluating educational service quality through a novel hybrid framework that integrates classic SERVQUAL dimensions with the contemporary Permendiktisaintek No. 39/2025 standards. The first-order Confirmatory Factor Analysis (CFA) empirically validated the structural stability and reliability of this hybrid measurement model. Aggregately, the overall Customer Satisfaction Index (CSI) reached 70.08%–84.40%, indicating a generally high level of student satisfaction. Crucially, the gap analysis explicitly confirms a negative performance-expectation gap of -0.47. Complementing these findings, the Importance-Performance Analysis (IPA) strategically mapped the instructional attributes across an operational quadrant matrix; physical laboratory infrastructure and digital connectivity were isolated within the critical quadrants requiring immediate intervention (Quadrants III and I), whereas educator competency, assessment transparency, and instructional interactivity were firmly secured within Quadrant II (Keep Up the Good Work). The original scientific value-add of this research lies in this successful hybridization of recent national regulatory standards with robust psychometric satisfaction metrics; it demonstrates that within an emerging operational environment, high faculty pedagogical competency acts as a vital institutional anchor that descriptively counterbalances a substantial physical deficit of -0.47, thereby sustaining positive student perceptions during the program's foundational phase.

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AUTHOR CONTRIBUTION STATEMENT

Andi Muhammad Akram Mukhlis, Syahrul, and Baso Intang Sappaile contributed to the conceptualization, research design, data collection, data analysis, and manuscript preparation. All authors have read and approved the final version of the manuscript.

AI DISCLOSURE STATEMENT

The authors declare that artificial intelligence (AI) tools were used in a limited capacity to assist in language editing and improving the clarity of the manuscript. All ideas, analyses, and conclusions presented in this study are the original work of the authors, and they take full responsibility for the content of this manuscript.

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