



The Impact of Process-Oriented Guided Inquiry Learning (POGIL) on Student Learning Outcomes: A Quasi-Experimental Study in an Indonesian Tourism Vocational School

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ABSTRACT

Active learning has become increasingly important in vocational hospitality education for enhancing student engagement and practical competencies. However, the effectiveness of Process Oriented Guided Inquiry Learning (POGIL) in improving hospitality service performance remains underexplored. This quasi-experimental study examined the impact of POGIL on 62 eleventh-grade Front Office students at Lembang Tourism Development Vocational School, Indonesia. Data were collected using validated cognitive, psychomotor, and affective assessment instruments and analyzed with Wilcoxon Signed-Rank and Mann-Whitney U tests. The results showed that the POGIL group achieved a higher normalized gain (0.48) than the control group (0.21; $p < 0.05$), indicating significant improvements in learning outcomes and service skills. These findings support the integration of POGIL into vocational hospitality curricula to strengthen students' readiness for professional service environments.

ARTICLE INFO

Article History:

Submitted/Received : 17 Dec 2025

First Revised : 15 Jan 2026

Accepted : 20 Mar 2026

First Available online : 29 Jun 2026

Publication Date : 29 Jun 2026

Keyword:

Active learning, Process Oriented Guided Inquiry Learning (POGIL), Student competencies, Vocational Education.

1. INTRODUCTION

Hospitality vocational education in Indonesia has historically evolved from an apprenticeship-based model, wherein learners developed competencies through observation and participation alongside experienced professionals in real-world service contexts (Silitonga, 2020). Over time, this experiential approach has been formalized into structured curricula that integrate theoretical instruction with both simulated environments and practical, workplace-based learning (Zgraggen, 2021; Rosenkranz, 2021). Nevertheless, many front office training programs continue to rely heavily on traditional lecture-based methods and instructor-led demonstrations. This pedagogical emphasis often results in graduates struggling to effectively transfer conceptual knowledge into dynamic, real-time guest service situations (Huilaja et al., 2022; Wang., 2022). Consequently, this disconnect hampers the development of cognitive proficiency in essential service competencies, including reservation systems, check-in/check-out procedures, and complaint handling skills that are critical to ensuring professional readiness in the contemporary hospitality industry.

To address persistent learning gaps, educational researchers increasingly promote active learning frameworks that position students as active participants in constructing knowledge, rather than passive recipients (Carvalho et al., 2020). One such model, Process-Oriented Guided Inquiry Learning (POGIL), originally designed for chemistry and engineering education, organizes instruction into three sequential phases exploration, concept invention, and application delivered through structured, collaborative activities under instructor facilitation (Idul., 2021; Treagust, 2020). This approach fosters both conceptual mastery and the development of key process skills such as critical thinking, problem-solving, and metacognitive awareness (Wang, 2025). Empirical evidence from meta-analyses in STEM fields consistently indicates that POGIL enhances conceptual understanding and long-term retention more effectively than conventional lecture-based methods (Joshi et al., 2021; Rodriguez et al., 2020), suggesting strong potential for its adaptation within vocational education contexts, including hospitality training.

Despite its proven effectiveness in STEM disciplines, the application of Process-Oriented Guided Inquiry Learning (POGIL) within service-oriented fields particularly front office education remains insufficiently examined. Unlike STEM contexts, where cognitive mastery is typically the central objective, front office roles demand the integration of procedural knowledge with interpersonal acumen and real-time situational judgment (Muzam et al, 2023). Excellence in guest service entails not only understanding what actions are required (e.g., room assignment procedures), but also how to execute these tasks with professionalism and when to adjust communication strategies based on guest behavior and expectations (Padma & Ahn, 2020). While conventional training methods may enhance discrete operational skills such as completing reservation forms or navigating property management systems, they often fall short in capturing the dynamic, unpredictable nature of authentic guest interactions. This limitation impedes learners' ability to effectively transfer classroom knowledge into practical, workplace settings (Nafukho et al, 2022; Galoyan & Betts, 2021).

Empirical evidence demonstrating cognitive gains through the implementation of POGIL offers valuable insights for curriculum developers at Lembang Tourism Development Vocational School, supporting the integration of guided inquiry modules into the front office syllabus. Moreover, statistically significant improvements in students' mastery of service protocols would align with the principles of outcomes-based education, a key component of the institutional accreditation framework. Such findings would enable program administrators to provide robust evidence of graduate competence to regulatory bodies and

industry stakeholders. This alignment not only strengthens the program's credibility but also informs targeted professional development initiatives for instructors, promoting a culture of reflective, evidence-informed teaching practice.

Although qualitative studies on active learning in hospitality education have highlighted increased student engagement and self-efficacy (McGinley et al., 2020; Memon et al., 2024), the absence of quasi-experimental research limits the ability to draw causal conclusions regarding its effectiveness in improving front office learning outcomes. At the same time, vocational accreditation agencies and industry stakeholders are increasingly demanding empirical evidence of student readiness, advocating for a constructive alignment between intended learning outcomes, instructional strategies, and assessment practices (Gopalan et al., 2020; Jackson et al., 2020). Without robust data on how inquiry-based pedagogies influence cognitive mastery of guest service protocols, educators lack a sound empirical foundation for curriculum redesign or targeted faculty development initiatives.

In response, scholars have called for extending POGIL research into guest-service training contexts to isolate its effects on students' cognitive development specifically their acquisition of factual knowledge, procedural fluency, and decision-making capabilities related to front office protocols. The novelty of this study lies in applying POGIL within a vocational hospitality setting to target students' cognitive mastery in three critical domains: reservation accuracy, policy application, and structured problem-solving in guest interactions. While affective and psychomotor domains are vital for professional success, cognitive mastery provides the basis upon which these higher-level skills are built. Establishing POGIL's efficacy in strengthening knowledge retention and conceptual clarity is thus a crucial first step. By employing validated assessment tools, this study aims to uncover specific cognitive weaknesses such as protocol comprehension and application that traditional lecture-based instruction may fail to address.

Furthermore, no prior research has concurrently measured cognitive, psychomotor, and affective outcomes of POGIL implementation within the hospitality education context. Most existing vocational studies adopt qualitative methodologies or non-comparative pre-post designs, thereby limiting their generalizability and capacity to infer causality (Zheng et al., 2025).

To bridge this gap, the present study employed a quasi-experimental design involving 62 eleventh-grade students enrolled in the Front Office course at Lembang Tourism Development Vocational School. Participants were purposefully divided into two groups: an experimental group engaged in POGIL-based learning through structured worksheets, role rotation, and reflective discussions, and a control group that received conventional lectures and instructor-led demonstrations. Pre- and post-instruction assessments, using validated multiple-choice instruments on front office service protocols, provided the empirical basis for evaluating learning outcomes.

Accordingly, this study aims to examine the effect of Process-Oriented Guided Inquiry Learning (POGIL) on students' cognitive mastery of front office service protocols specifically focusing on reservation accuracy, policy application, and structured problem-solving by comparing pre- and post-test performance between POGIL and conventional instruction groups.

1.1 Problem Statment

Despite ongoing reforms in vocational hospitality curricula, many programs continue to rely heavily on lecture-based instruction and instructor-led demonstrations. This pedagogical approach often leaves graduates inadequately equipped to meet the dynamic and complex demands of modern service environments. As a result, students frequently fall short in achieving integrated learning outcomes, particularly in the cognitive mastery of service

protocols, psychomotor skills required for handling guest interactions, and the professional attitudes expected by industry employers ultimately compromising their job readiness (Wang et al, 2020; Kusmawan et al, 2025).

This study investigates the impact of Process-Oriented Guided Inquiry Learning (POGIL) on students' cognitive learning outcomes within the Front Office course at Lembang Tourism Development Vocational School. Specifically, it explores the extent to which POGIL improves knowledge retention and conceptual understanding related to guest-service protocols, while identifying areas where learners may continue to face challenges. By analyzing pre- and post-instruction cognitive test scores from both the POGIL and control groups, this research seeks to reveal procedural knowledge gaps and provide actionable recommendations for enhancing curriculum alignment with evolving industry expectations.

1.2 Research Aim

In response to the challenges outlined in the problem statement, this study seeks to examine the effects of instructional strategies on students' cognitive learning outcomes within the Front Office course at Lembang Tourism Development Vocational School. The research is guided by the following three specific objectives:

1. To evaluate the impact of Process-Oriented Guided Inquiry Learning (POGIL) on students' cognitive learning outcomes by analyzing changes in pre- and post-instruction test scores within the experimental group.
2. To assess the effect of conventional lecture-and-demonstration instruction on students' cognitive learning outcomes by comparing pre- and post-test results in the control group.
3. To compare the relative effectiveness of POGIL and traditional instructional methods by analyzing between-group differences in cognitive learning gains from pre- to post-instruction.

2. METHOD

This study adopted a quantitative quasi-experimental approach, specifically utilizing a non-equivalent control group design, to investigate the impact of instructional methods on students' cognitive learning outcomes in the Front Office course at Lembang Tourism Development Vocational School. Quasi-experimental designs are appropriate when random assignment is impractical, allowing for meaningful comparisons of intervention effects in naturally occurring groups (Hardani et al., 2020). Two intact eleventh-grade classes, matched based on their baseline academic performance, were designated as the experimental group (receiving POGIL instruction) and the control group (receiving conventional lectures and demonstrations). Both groups completed a pre-test to establish initial equivalence and a post-test to assess learning gains, enabling both within-group and between-group comparisons of cognitive achievement.

Data were collected using a rigorously constructed multiple-choice test, developed to assess students' cognitive mastery of guest service protocols, including reservation accuracy, check-in/check-out procedures, and complaint resolution. The content validity of the instrument was established through expert evaluation by two experienced vocational hospitality educators (Rokeman et al., 2024; Suhaini et al., 2021). A pilot study was conducted involving 30 students from Class XI PH3 to evaluate the psychometric properties of the test. The original pool consisted of 60 items, which were analyzed using item-total correlation, difficulty index, and discrimination index in SPSS. Items that did not meet the criteria of Pearson's $r > .30$ or exhibited poor discrimination or extreme difficulty levels were either

revised or excluded. The final instrument met established standards for validity and reliability (Zhou et al., 2022; Yandriani et al., 2020; Zakariya, 2022).

Table 1. *Mid-Semester Exam (PTS) Averages*

Class	Mean Mid-Semester Exam Score
Class XI Hospitality 1 (n = 31)	79.03
Class XI Hospitality 2 (n = 31)	79.58
Class XI Hospitality 3 (n = 30)	81.39

Table 1 presents the mid-semester (PTS) average scores for three Grade XI Hospitality classes. Class XI Hospitality 1, with a mean score of 79.03, was designated as the control group, receiving instruction through conventional lecture and demonstration. Class XI Hospitality 2, with a comparable mean of 79.58, served as the experimental group exposed to Process-Oriented Guided Inquiry Learning (POGIL). The near equivalence in academic performance between the two groups ensured baseline comparability. Meanwhile, Class XI Hospitality 3 (mean = 81.39) was excluded from the main intervention and instead utilized for pilot testing and instrument validation, due to its slightly higher average, minimizing potential bias while allowing robust psychometric analysis of the test instruments.

The final study sample consisted of 62 Grade XI Front Office students from Lembang Tourism Development Vocational School, drawn from the two selected classes. To confirm initial group equivalence, an independent samples t-test was conducted on pre-test scores, revealing no statistically significant difference between groups ($p > .05$), thus validating the sampling approach (Inayah et al., 2024). Prior to hypothesis testing, both pre- and post-test distributions were examined for normality. Following the guidance of Murakami et al. (2023), nonparametric rank-based methods such as the Wilcoxon Signed Rank test were considered appropriate in the event of non-normal distributions, as they are less sensitive to deviations from parametric assumptions. Consistent with this approach, Lachin (2020) recommends the Wilcoxon Signed Rank test for paired samples and the Mann–Whitney U test for between-group comparisons in such cases. Accordingly, if the data satisfied normality and variance homogeneity assumptions, paired sample t-tests and independent sample t-tests were used to evaluate within-group (pre- vs. post-test) and between-group (gain score) differences, respectively. In cases where normality was violated, the analysis proceeded with the Wilcoxon Signed Rank and Mann–Whitney U tests. All statistical tests were conducted at an alpha level of .05, and effect sizes were calculated to quantify the magnitude of observed differences (Rubin, 2021; Ghanad, 2023). This analytical strategy ensures a rigorous and valid assessment of POGIL's instructional impact under authentic classroom conditions.

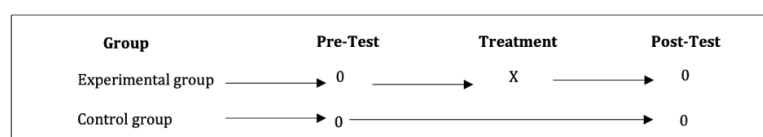


Fig. 1 *Paired Pretest-Posttest Control Group Design.*

Figure 1 presents the conceptual model underpinning this study's hypothesis. The independent variable Process-Oriented Guided Inquiry Learning (X) is implemented in the experimental group, while the control group receives instruction via conventional lecture and demonstration methods. Both groups are subsequently evaluated using identical instruments measuring Student Learning Outcomes (Y), operationalized as cognitive mastery of guest

request handling protocols. The diagram's unidirectional arrows reflect the distinct pedagogical treatments assigned to each group, while the convergence of arrows toward the outcome variable (Y) visually represents the study's comparative design indicating that any post-instruction performance differences can be reasonably attributed to the type of instruction received.

As a quasi-experimental design, this approach supports approximate causal inference by enabling structured comparisons between non-randomized but academically equivalent groups in a naturalistic educational setting (Pacheco et al., 2020; Corrêa Da Silva, 2022). Both the experimental and control groups completed pre- and post-tests under identical conditions, allowing differential gains in the POGIL group to serve as valid evidence of guided inquiry's targeted effect on cognitive learning outcomes within vocational front office education.

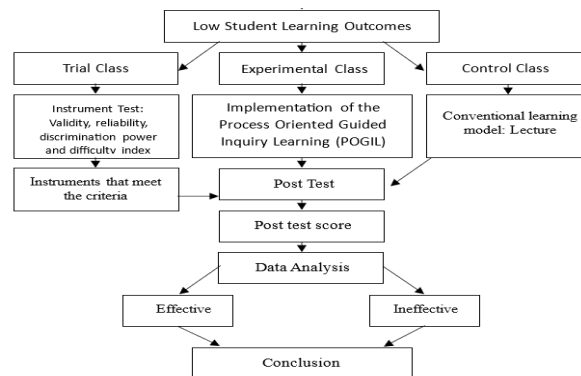


Fig. 2 Research Flow Chart

Figure 2 illustrates a structured, four-phase research workflow designed to evaluate the impact of instructional strategies on students' cognitive mastery of guest-service protocols. The process begins with a Research Background phase, during which mid-semester exam data are reviewed to identify areas of low student learning outcomes. This diagnostic step leads to the formation of three concurrent research tracks: a Trial Class for instrument validation, and two treatment groups an Experimental Class receiving POGIL-based instruction and a Control Class following conventional lecture-based teaching. In the Trial Class, a 60-item multiple-choice instrument undergoes rigorous psychometric analysis, including assessments of validity, reliability, item discrimination, and difficulty level. Only statistically robust items are retained for use in the main study. Meanwhile, the Experimental and Control groups proceed through their respective instructional interventions. Upon completion of the teaching phase, all participants undertake a standardized post-Test. The resulting data are analyzed to compare learning gains across groups, thereby determining the relative effectiveness of the POGIL intervention. The study concludes with a synthesis of findings, offering actionable insights to inform curriculum design and instructional best practices. In accordance with this model, both groups also completed a 60-item pre-test to establish baseline equivalence prior to instruction.

Table 2. Distribution of Multiple-Choice Items by Learning Outcome Domain

Variable	Variable Domain	Number of Question	Description	Source
Learning Outcomes	Cognitive (C)	26	Items assessing C1–C6: Questions 1, 2, 5, 6, 8, 11, 12, 14, 16, 17, 20, 2 2, 24, 28, 30, 31, 39, 41, 42, 48, 50, 51, 54, 55, 59	Bovier, E. R., & Dion, G. (2024).

Affective (A)	24	Items assessing A1–A5: Questions 21, 22, 23, 24, 25, 26, 27, 29, 32, 33, 36, 37, 38, 40, 42, 44, 45, 46, 47, 50, 51, 53, 54, 57	Akintomide, A., & Kim, D. J. (2024).
Psychomotor (P)	10	Items assessing P1–P4: Questions 11, 12, 14, 16, 20, 28, 30, 31, 35, 43	
Total	60		

Notes:

- Several test items are double-tagged (e.g., C2 + A1 or C4 + P1), meaning they assess multiple learning domains and therefore appear in more than one category.
- Within each domain (Cognitive, Affective, or Psychomotor), item numbers are organized in ascending order for clarity and consistency.

Table 2 presents a detailed classification of all 60 multiple-choice test items mapped to the three primary learning outcome domains assessed in this study. The Cognitive domain (C1–C6) encompasses 26 items evaluating students' knowledge recall, comprehension, analytical reasoning, evaluative judgment, and creative problem-solving abilities related to guest-request handling. The Affective domain (A1–A5) includes 24 items aimed at measuring students' attitudes and value orientations, ranging from basic receptivity to the internalization of professional hospitality dispositions. The Psychomotor domain (P1–P4) consists of 10 items that assess students' capacity to imitate procedures, manipulate tools or information, execute precise techniques, and articulate complex service actions. Several items are double-tagged (e.g., C2 + A1 or C4 + P1), reflecting their alignment with multiple domains; as such, they appear in more than one category. This multidimensional classification enables a more targeted evaluation of learning outcomes and facilitates nuanced analysis of instructional impact across cognitive, affective, and psychomotor competencies.

3. RESULTS

Following item-total correlation analysis at a significance level of $\alpha < .05$, 41 out of the original 60 multiple-choice items met the required validity thresholds and were retained for further analysis. These validated items were subsequently categorized based on the three targeted learning outcome domains. Table 3 provides a summary of the distribution of these 41 valid items across the cognitive, affective, and psychomotor domains, reflecting the multidimensional structure of the assessment framework.

Table 3. *Distribution of Validated Items by Learning-Outcome Domain*

Variable	Domain	Number of Items	Description
Learning Outcomes	Cognitive (C)	18	Valid items assessing C1–C6 (e.g., knowledge recall through creative problem-solving).
	Affective (A)	16	Valid items assessing A1–A5 (e.g., receiving information through characterizing professional attitudes).
	Psychomotor (P)	7	Valid items assessing P1–P4 (e.g., imitation of procedures up to precise execution).

As shown in Table 3, among the 41 validated items, a subset demonstrated high discrimination power and were directly adopted into the final assessment instrument. The

remaining items though meeting basic validity criteria exhibited borderline values in terms of difficulty or discrimination indices and were therefore flagged for future refinement at the item level. The 19 excluded items were removed due to either non-significant item-total correlations or extreme difficulty values, rendering them unsuitable for inclusion. Consequently, the final provisional instrument consists of 41 validated items, deemed appropriate for pilot deployment, with ongoing calibration planned for those items identified as requiring further revision.

To assess the impact of Process-Oriented Guided Inquiry Learning (POGIL) on student achievement in guest request handling and to compare its effectiveness with that of conventional lecture-based instruction both descriptive and inferential statistical analyses were conducted on the pre- and post-test data.

Figure 1. Comparison of Mean Scores and Normalized Gains Between POGIL and Control Groups

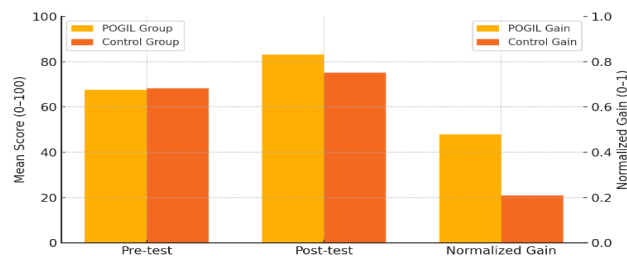


Fig. 3 Comparative Performance: Pre-Test, Post-Test, and Normalized Gain for Experimental (POGIL) and Control Groups

Figure 3 presents a visual summary of the descriptive results, displaying mean pre- and post-test scores alongside normalized gain values for both the POGIL (experimental) and conventional (control) groups. The chart clearly demonstrates that the experimental group not only began and concluded the instructional period with higher average scores, but also achieved significantly greater learning gains. Specifically, following POGIL implementation, the average test score increased by more than 15 points, compared to an improvement of approximately 7 points observed in the control group. In addition, the normalized gain for the POGIL cohort was nearly double that of the conventional group, highlighting the enhanced effectiveness of guided inquiry learning in promoting cognitive mastery of front office protocols.

To provide a more detailed comparison of group performance, Table 4 reports each cohort's mean, minimum, and maximum scores on both the pre- and post-tests, along with their respective normalized gain values. These descriptive statistics underscore the initial equivalence between the experimental and control groups at baseline, while also illustrating the greater magnitude of improvement achieved through POGIL instruction compared to conventional lecture-based methods.

Table 4. Descriptive statistics for pre- and post-test scores and normalized gains

Test Phase	Group	Mean	Min / Max
Pre-test	Experimental	67.65	62 / 76
	Control	68.32	57 / 76
Post-test	Experimental	83.26	73 / 92
	Control	75.10	70 / 81

Gain	Experimental	0.48	0.16 / 0.73
	Control	0.21	0.00 / 0.49

Following Table 4, the data indicate that both groups exhibited comparable initial score distributions (Experimental: 62–76; Control: 57–76), confirming equivalence at baseline. Post-intervention results, however, reveal a markedly greater improvement in the experimental group, with scores ranging from 73 to 92, compared to a more limited increase in the control group (70 to 81). Notably, the normalized gain score for the POGIL group was 0.48, more than double that of the control group (0.21). These findings underscore the enhanced effectiveness of POGIL in fostering cognitive mastery of guest request handling protocols.

To assess the suitability of parametric testing, the Kolmogorov–Smirnov and Shapiro–Wilk tests were applied to the score distributions of each group, as summarized in Table 5. In all cases, results yielded p-values below .05, indicating statistically significant departures from normality. This violation of normality assumptions renders the use of parametric tests, such as t-tests, inappropriate for the present data. As recommended by Murakami et al. (2023), rank-based nonparametric procedures such as the Wilcoxon Signed-Rank test for paired samples are more robust under these conditions. Furthermore, in alignment with, Lachin (2020) guidelines, the Mann Whitney U test was selected for analyzing independent samples. Based on this decision logic (see Figure 4.8), and following confirmation of variance homogeneity, all subsequent inferential analyses were conducted using nonparametric techniques.

Table 5. Normalized gains Normality test results (Kolmogorov–Smirnov & Shapiro–Wilk)

Group	Test	Statistic	df	p-value
Control Pretest	<i>Kolmogorov–Smirnov</i>	0,165	33	0,023
	<i>Shapiro–Wilk</i>	0,935	33	0,048
Control Posttest	<i>Kolmogorov–Smirnov</i>	0,208	31	0,001
	<i>Shapiro–Wilk</i>	0,908	31	0,011
Experiment Pretest	<i>Kolmogorov–Smirnov</i>	0,192	31	0,005
	<i>Shapiro–Wilk</i>	0,923	31	0,029
Experiment Posttest	<i>Kolmogorov–Smirnov</i>	0,174	31	0,018
	<i>Shapiro–Wilk</i>	0,932	31	0,048

Table 5 presents the results of the normality tests, with all distributions yielding p-values less than .05, thereby confirming significant deviations from normality. This violation invalidates the assumptions required for parametric testing and necessitates alternative statistical approaches. In accordance with the recommendations of Lachin (2020), rank-based nonparametric methods were deemed more appropriate specifically, the Wilcoxon Signed-Rank test for analyzing paired samples and the Mann Whitney U test for independent group comparisons. Following this decision framework, and after verifying the assumption of variance homogeneity, all inferential analyses were conducted using these nonparametric techniques.

Table 6. Wilcoxon Signed-Rank test statistics

Group	Z	Asymp. Sig. (2-tailed)
Control Class	-4,806	0,000
Experiment Class	-4,875	0,000

Table 6 presents the results of the Wilcoxon Signed-Rank tests, which revealed statistically significant improvements in both the control group ($Z = -4.806$, $p < .001$) and the experimental group ($Z = -4.875$, $p < .001$). These findings confirm that both instructional methods positively impacted student performance in the Front Office assessment. However, the between-group comparison using the Mann–Whitney U test (Table 7) demonstrated a significant advantage for the POGIL cohort. The experimental group achieved a substantially higher mean rank than the control group ($U = 88.000$, $Z = -5.593$, $p < .001$), leading to the rejection of the null hypothesis. These results suggest that Process-Oriented Guided Inquiry Learning (POGIL) produced significantly greater learning gains in service-protocol mastery than traditional lecture-based instruction.

Table 7. Mann–Whitney U test summary

Test	Mann–Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)
Posttest Experiment vs Control	88,000	584,000	-5,593	0,000

Table 7 presents the results of the Mann–Whitney U test, which revealed a statistically significant difference in post-test performance between the two groups ($U = 88.000$, $Z = -5.593$, $p < .001$). This outcome indicates that students exposed to Process-Oriented Guided Inquiry Learning (POGIL) achieved markedly higher gains in service-related competencies than those taught through conventional lecture-based methods, highlighting the instructional superiority of the guided inquiry approach.

4.DISCUSSION

The findings of this study provide compelling evidence that Process-Oriented Guided Inquiry Learning (POGIL) leads to significantly greater and more consistent improvements in Front Office course outcomes compared to traditional lecture-based methods. While both groups exhibited comparable mid-level proficiency at the outset, only students in the POGIL group advanced into the upper performance strata following the intervention. This marked rightward shift in the post-test score distribution underscores the cumulative pedagogical effects of the POGIL model particularly its iterative phases of exploration, concept invention, application, and reflection in fostering deeper internalization of service procedures and the development of adaptive problem-solving skills. These outcomes align with previous studies by Idul, J. J. A., & Caro, V. B. (2022). and Mamombe & Mathabathe (2024), who similarly observed substantial gains in critical thinking and collaborative learning under guided inquiry frameworks.

Although the control group also demonstrated statistically significant gains, their improvement remained largely within the upper-middle performance range. This trend is consistent with findings by Lin and Lee (2023) and Joshi, N., & Lau, S. K. (2021), who observed that conventional lecture methods even when paired with structured exercises tend to promote surface-level understanding. In such settings, learners may achieve procedural competence but often lack the metacognitive awareness needed to navigate unfamiliar service scenarios or transfer knowledge across contexts. The tied ranks observed in the

Wilcoxon analysis for the control group further suggest that some students retained initial misconceptions despite uniform content delivery, reinforcing the notion that passive instructional approaches may fall short in cultivating deeper cognitive engagement.

A comparative analysis of normalized gain distributions reveals a more pronounced divergence between the two instructional approaches. Within the POGIL cohort, a substantial proportion of students attained medium to high learning gains, suggesting that collaborative inquiry and peer accountability can significantly enhance educational outcomes. This finding is consistent with previous research by Özkanbaş, M., & Taştan Kırık, Ö. (2023) and Rodriguez et al. (2020), who reported that POGIL's structured group roles and emphasis on reflective questioning bolster metacognitive self-regulation and foster sustained engagement. Moreover, students exposed to the POGIL model expressed heightened motivation and a stronger sense of ownership over their learning an affective dimension notably absent in the control group. These outcomes suggest that POGIL not only strengthens cognitive performance but also cultivates learner self-efficacy and intellectual curiosity, yielding a more holistic educational impact.

Due to violations of normality assumptions in both pre- and post-test distributions, nonparametric statistical procedures were employed. Guided by the analytical frameworks of Murakami et al. (2023) and Lachin (2020), the Wilcoxon Signed-Rank test was applied to assess within-group changes, revealing statistically significant gains across both instructional modalities. Notably, the POGIL cohort displayed exclusively positive ranks an exceptional outcome in quasi-experimental designs indicating that all participants experienced measurable improvement following the intervention. Furthermore, between-group comparison via the Mann–Whitney U test confirmed that post-test scores in the experimental group were significantly higher than those in the control group ($U = 88$, $p < .001$). These findings collectively underscore the efficacy of guided inquiry in enhancing service-oriented competencies, both in magnitude and consistency.

In addition to measurable gains in assessment outcomes, the POGIL approach cultivated more cohesive and dynamic classroom communities of practice. Observational data revealed that student teams engaged in sustained, purposeful dialogue around service-related dilemmas, adapted team roles fluidly in response to task demands, and regularly exchanged constructive peer feedback. These collaborative behaviors align with the principles of high-reliability teaming as conceptualized by William et al. (2022), wherein mutual accountability and shared cognition are central. Such emergent social structures likely contribute to the durability of learning gains, as students move beyond passive content absorption to actively co-construct knowledge and meaning. This collaborative foundation may, in turn, support more agile and contextually attuned behaviors in real-world hospitality environments.

From a curriculum development perspective, the results underscore the potential of integrating POGIL-based modules within vocational hospitality training to enhance alignment between instructional design and targeted service competencies (Houghton, 2023). Rather than maintaining a dichotomy between theoretical lectures and practical exercises, guided inquiry repositions each classroom session as a simulated apprenticeship environment. Within this framework, scaffolded activities can mirror authentic industry challenges such as managing high-volume guest interactions during peak periods while simultaneously fostering critical competencies. Instructors may intentionally structure the application phase to promote skills like task prioritization, manual precision, and emotional regulation, all under conditions that approximate real-world service pressures.

Scaling the implementation of POGIL requires a sustained, multi-tiered approach to professional development that moves beyond one-off introductory workshops. Educators

must receive continuous support in crafting inquiry-based learning materials, orchestrating effective team-based interactions, and employing formative assessment techniques to guide student learning (Paseka et al., 2023). Embedding "POGIL champions" experienced practitioners who serve as peer mentors and lead reflective teaching communities can be instrumental in maintaining model fidelity. Such internal leadership helps cultivate a professional culture rooted in inquiry, collaboration, and pedagogical innovation within vocational institutions.

Several methodological constraints warrant consideration. First, the use of intact classroom groups without random assignment and the single-institution setting limit the generalizability of the results. Second, the brief duration of the intervention and reliance on a single-format, multiple-choice assessment may have restricted the measurement of long-term learning retention and the development of psychomotor or affective competencies. Third, while facilitator field notes offered valuable insights into classroom dynamics, the absence of systematic coding or triangulation with student self-reports represents a missed opportunity for deeper interpretive rigor. To strengthen future investigations, researchers should adopt longitudinal, multi-institutional designs incorporating mixed-methods strategies such as direct performance assessments, structured classroom observations, and learner interviews to provide a more nuanced and comprehensive understanding of POGIL's educational impact.

In conclusion, this study reinforces the growing body of evidence supporting structured guided inquiry as a means to integrate theoretical understanding with practical competence in vocational education. The demonstrated efficacy of the POGIL approach in promoting multidimensional learning outcomes underscores its potential to transform hospitality training into a more learner-centered, inquiry driven ecosystem. By shifting the instructional paradigm from passive reception to active co-construction of knowledge, POGIL offers a compelling framework for aligning pedagogy with the complex, adaptive demands of contemporary service industries.

5. CONCLUSION

This study provides compelling evidence that the Process-Oriented Guided Inquiry Learning (POGIL) model significantly enhances student learning outcomes in vocational hospitality education, specifically in the Front Office course at Lembang Tourism Development Vocational School. By employing a structured sequence of exploration, concept formation, application, and reflection, POGIL fosters both conceptual understanding and practical competency. The model's emphasis on student-centered inquiry, peer collaboration, and active engagement facilitated consistent academic growth and promoted greater classroom participation and self-regulated learning.

While the control group, taught through traditional lecture-demonstration methods, did show improvement, their learning gains were comparatively modest and less uniformly distributed. The conventional format, though effective for foundational comprehension, lacked the interactive and reflective depth needed to cultivate higher-order thinking and transferable service skills. Several students in this group remained passive, relying heavily on instructor-led explanations, which limited their ability to engage deeply with the material.

In contrast, the POGIL cohort exhibited steady, comprehensive progress across all assessed domains. The absence of learning regression among participants suggests that this model accommodates diverse learning needs while fostering a supportive, intellectually stimulating environment. POGIL's integration of structured teamwork, metacognitive

questioning, and iterative feedback encourages learners to become active constructors of knowledge an essential attribute in preparing for real world service contexts.

In summary, the findings endorse POGIL as a pedagogically robust strategy for vocational training programs that prioritize procedural fluency and applied competencies. Its learner-driven framework offers marked advantages over traditional didactic approaches and equips students with the critical thinking, adaptability, and interpersonal skills required in contemporary hospitality settings.

6. Acknowledgement

The authors extend their sincere gratitude to Universitas Pendidikan Indonesia and the Tourism Vocational High School for their generous support, collaboration, and provision of resources throughout the course of this research. Their contributions were instrumental in the successful implementation and completion of this study.

7. Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

8. Author Contribution

The authors confirm contribution to the paper as follows: study conception and design: Riko Arrasyid, Reyfan Triansyah Wiriadi; data collection: Riko Arrasyid, Reyfan Triansyah Wiriadi; analysis and interpretation of results: Riko Arrasyid, Reyfan Triansyah Wiriadi; draft manuscript preparation: Riko Arrasyid, Reyfan Triansyah Wiriadi. All authors reviewed the results and approved the final version of the manuscript.

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