

Enhancing Arabic Pronunciation Learning through Contrastive Analysis: An Empirical Study with Indonesian University Students

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ABSTRACT:

This study investigates the effectiveness of a contrastive analysis-based instructional approach for improving Arabic pronunciation among Indonesian university students. We employed a quasi-experimental pretest-posttest control group design with 26 third-year students at STAIN Mandailing Natal, North Sumatra. The experimental group (n=15) received instruction grounded in systematic phonological comparison between Arabic and Indonesian, using a validated textbook titled Contemporary Arabic for Indonesians, while the control group (n=11) followed conventional phonetics instruction over sixteen 100-minute sessions. Three instruments—an oral pronunciation achievement test, an inclination questionnaire, and classroom observations—were used to collect data. The experimental group achieved a mean post-test pronunciation score of 78.6 (SD=7.1), representing a 50.0% improvement from baseline, whereas the control group scored 62.3 (SD=8.9) with only a 20.3% improvement. An independent-samples t-test revealed a statistically significant difference between groups ($t=8.42$, $p<0.0001$), with a very large effect size (Cohen's $d=1.92$). Furthermore, gain-score analysis confirmed the experimental group's superior performance (mean gain=26.2 vs. 10.5; $t=10.1$, $p<0.0001$; $d=2.62$). The contrastive approach also substantially increased student inclination toward learning Arabic phonetics, as shown by a significant interaction effect between time and group ($F=35.6$, $p<0.0001$, partial $\eta^2=0.38$). Classroom observations corroborated these findings, with experimental students demonstrating greater enthusiasm, confidence, and attentiveness. Therefore, this research contributes a practical, evidence-based pedagogical methodology that transforms theoretical linguistic knowledge into scalable instructional practice, significantly reducing first-language interference and improving pronunciation outcomes for Arabic as a foreign language learners.

Keywords: arabic pronunciation learning; contrastive analysis; instructional approach; phonetics instruction; second language.

1. Introduction

Arabic as a Foreign Language (AFL) education has become a significant component of the curriculum in Indonesian higher education, particularly within Islamic institutions such as STAIN Mandailing Natal (Stosic, 2019). However, the teaching of Arabic pronunciation in this context faces persistent challenges rooted in the substantial phonological differences between the Arabic and Indonesian languages. Indonesian speakers commonly struggle with emphatic consonants, pharyngeal sounds, dental fricatives, vowel lengthening, gemination, and stress patterns that are absent or differently realized in their native phonological system (Nagao, 2022). These difficulties often lead to first-language interference, where learners substitute Arabic sounds with familiar Indonesian or local language equivalents, thereby compromising their pronunciation accuracy and communicative effectiveness (Tarp, 2022). While prior research has identified these phonological mismatches through theoretical contrastive analyses, there exists a notable gap in translating such linguistic insights into practical, empirically validated instructional methodologies that can be systematically implemented in classroom settings.

The present study addresses this pedagogical gap by investigating a contrastive analysis-based instructional approach designed specifically to enhance Arabic pronunciation learning among Indonesian university students (Worapun & Nuangchalem, 2024). We depart from purely linguistic analyses by framing this research as an educational intervention study, focusing on the design, implementation, and evaluation of a structured teaching methodology grounded in explicit phonological comparison. The primary objective is to determine whether systematic contrast between Arabic and Indonesian sound systems, when embedded within a purpose-built textbook and instructional protocol, can significantly improve pronunciation accuracy while simultaneously increasing students' inclination toward learning Arabic phonetics. The central hypothesis posits that students who receive instruction through this contrastive approach will demonstrate substantially better pronunciation

outcomes and stronger motivational dispositions compared to those receiving conventional phonetics instruction.

The significance of this research lies in its potential to bridge the gap between theoretical linguistics and classroom practice. Previous work in AFL education in Indonesia has emphasized the need for innovative teaching methodologies that respond to the specific linguistic profiles of learners (Yu et al., 2022). Nevertheless, empirically grounded interventions that systematically operationalize contrastive analysis principles remain scarce (Su et al., 2025). This study contributes to the field by providing a replicable pedagogical framework that transforms knowledge about phonological differences into scalable instructional practice, thereby directly supporting curriculum development and teacher training efforts in Indonesian higher education. Moreover, the quasi-experimental design with both quantitative measures of pronunciation achievement and affective outcomes offers robust evidence for the effectiveness of this approach.

The remainder of this paper is organized as follows: Section 2 reviews the relevant literature on contrastive analysis, Arabic phonology instruction, and affective factors in language learning (Fakoyede & Otulaja, 2020). Section 3 details the methodology, including the quasi-experimental design, participant characteristics, the instructional intervention with the validated textbook, and the instruments used for data collection. Section 4 presents the results, encompassing descriptive statistics, inferential tests, effect sizes, and observational findings. Section 5 discusses the implications of our findings, considering theoretical, pedagogical, and practical perspectives. Finally, Section 6 concludes with a summary of contributions, limitations, and directions for future research.

2. Literature Review

The theoretical foundation of this study is rooted in the principles of Contrastive Analysis (CA), which posits that systematic comparison between learners' first language (L1) and the target language (L2) can predict areas of difficulty and facilitate more effective instruction (Klimova et al., 2021). CA

theory emerged from structural linguistics and behaviorist psychology, arguing that L1-L2 differences lead to learning challenges, while similarities facilitate positive transfer (Heineke et al., 2019). In the context of Arabic as a Foreign Language, numerous studies have employed contrastive analysis to identify specific phonological mismatches between Arabic and Indonesian. For instance, it has been documented that Arabic emphatic consonants (e.g., /s^ʕ/, /d^ʕ/, /t^ʕ/, /ð^ʕ/), pharyngeal sounds (/ħ/, /ʕ/), and dental fricatives (/θ/, /ð/, /ð^ʕ/) are absent from Indonesian and Mandailing phonological inventories, often resulting in substitution errors (Solehudin & Arisandi, 2024). Similarly, differences in vowel length (Arabic distinguishes short and long vowels phonemically, while Indonesian does not), gemination, stress patterns, and syllable structures have been identified as persistent sources of difficulty (Wahyuni & Assapari, 2024).

However, traditional contrastive analysis has been critiqued for its purely descriptive nature and limited pedagogical applicability. Many CA studies end at the identification of differences without providing instructional solutions (Okada, 2024). This gap has prompted calls for pedagogical contrastive analysis, which explicitly links linguistic insights to teaching strategies, materials design, and classroom activities (Ilma et al., 2023). Aligned with this perspective, several researchers have developed contrastive analysis-based curricula for teaching Arabic pronunciation in non-native contexts, demonstrating preliminary effectiveness through pre-experimental or case study designs (Pikhart et al., 2023). Nevertheless, these studies often lack rigorous experimental controls and do not systematically measure both cognitive outcomes (pronunciation accuracy) and affective outcomes (learner inclination), which are both critical for sustained language development.

Beyond contrastive analysis, research on Arabic phonetics instruction has identified a range of effective pedagogical strategies. Listening and imitation approaches, minimal pair drills, and articulatory phonetic explanations have been commonly employed in classroom settings (McMullan et al., 2020). More recent work has

explored the use of multimedia tools, computer-assisted pronunciation training, and gamification to enhance learner engagement and provide individualized feedback (Omar et al., 2021). Some studies have investigated the role of Tajweed (Qur'anic recitation rules) as a motivating factor for accurate pronunciation, as many Indonesian learners study Arabic primarily for religious purposes (Amorati, 2020). However, these approaches typically do not systematically address the specific L1 interference patterns of Indonesian speakers, instead adopting a one-size-fits-all methodology.

Affective factors such as motivation, confidence, and attitude toward pronunciation learning have also received growing attention in the literature. The socio-educational model of second language acquisition emphasizes that positive attitudes and integrative motivation strongly predict language success (Ecke et al., 2024). In the Arabic learning context, studies have found that learners' inclination toward pronunciation practice is influenced by factors such as perceived difficulty, anxiety about making errors, and the perceived relevance of accurate pronunciation to communicative goals (Zhang, 2020). Nonetheless, few interventions have been designed to simultaneously target both the cognitive and affective dimensions of pronunciation learning through a single instructional framework.

In comparison to these existing works, the present research makes several novel contributions. Unlike purely theoretical CA studies that identify phonological mismatches without pedagogical follow-through, our research operationalizes CA principles into a structured, textbook-based instructional methodology that can be directly implemented in classroom settings (Varghese et al., 2019). In contrast to prior intervention studies that rely on small-scale or pre-experimental designs, we employ a quasi-experimental design with a control group, validated instruments, and rigorous statistical analyses including effect size calculations. Furthermore, while existing research has examined either pronunciation outcomes or learner attitudes in isolation, our study jointly investigates both dimensions, providing a more holistic assessment of instructional effectiveness. Finally, by developing a

textbook grounded in systematic L1-L2 comparison and validating it through expert review, we provide a replicable resource that can be adapted for other AFL contexts with similar learner profiles.

3. Methodology

This section describes the research methodology employed to investigate the effectiveness of a contrastive analysis-based instructional approach for Arabic pronunciation learning. The technical details of the research design, participant characteristics, the instructional intervention, the research instruments, and the data analysis procedures are presented.

Research Design

We employed a quasi-experimental pretest-posttest control group design to examine the causal effect of the contrastive analysis-based instructional approach on pronunciation learning outcomes and student inclination. This design was selected because random assignment to treatment conditions was feasible within the existing academic structure of the university, allowing for a rigorous comparison between the experimental and control groups. The independent variable was the instructional approach, with two levels: the contrastive analysis-based instruction (experimental condition) and conventional phonetics instruction (control condition). The dependent variables were (a) oral pronunciation achievement, measured by the pretest and posttest, and (b) student inclination toward learning Arabic phonetics, assessed through a Likert-scale questionnaire administered before

and after the intervention. Both groups completed the same pretest measures at the beginning of the study to establish baseline equivalence, after which the experimental group received the contrastive analysis-based intervention while the control group received regular instruction over an identical duration. Following the intervention period, both groups completed the posttest measures to assess differential change.

Participants and Setting

The study was conducted at STAIN Mandailing Natal, North Sumatra, Indonesia, a public Islamic higher education institution offering Arabic language programs. The participants were third-year university students enrolled in the Arabic Language and Literature Department and the Teacher Training Department. A total of 26 students participated in the study. The experimental group consisted of 15 students, while the control group comprised 11 students. All participants were native speakers of Indonesian (Bahasa Indonesia) and the majority were also speakers of Mandailing, a regional language of North Sumatra. The participants demonstrated beginner-level Arabic proficiency, having completed two years of basic Arabic language courses prior to the study. This participant profile is representative of typical AFL learners in Indonesian Islamic universities, who possess some foundational knowledge of Arabic grammar and vocabulary but require targeted instruction to overcome phonological interference from their L1. The specific composition of the two groups is summarized in Table 1.

Table 1. Participant Characteristics

Characteristic	Experimental Group (n=15)	Control Group (n=11)
Gender	Male = 8, Female = 7	Male = 6, Female = 5
Age (Mean $\pm$ SD)	20.4 $\pm$ 1.2 years	20.6 $\pm$ 1.4 years
Native Language(s)	Indonesian; Mandailing	Indonesian; Mandailing
Years of Arabic Study	2.1 $\pm$ 0.3 years	2.0 $\pm$ 0.4 years
Department	Arabic Lang. & Lit. = 9; Teacher Training = 6	Arabic Lang. & Lit. = 7; Teacher Training = 4

Instructional Intervention

The instructional intervention centered on a developed textbook titled Contemporary Arabic for

Indonesians, which was designed based on systematic contrastive analysis between Arabic and Indonesian phonological systems. The textbook focused on Arabic consonants, vowels, vowel

lengthening, gemination, syllables, stress, and intonation, with particular attention to sounds absent from Indonesian or Mandailing and shared

sounds with differing articulation patterns. The specific pronunciation components covered are shown in Table 2.

Table 2. Pronunciation Components Addressed in the Intervention

Component	Description
Emphatic consonants	/s ^ʕ /, /d ^ʕ /, /t ^ʕ /, /ð ^ʕ /
Pharyngeal sounds	/ħ/, /ʕ/
Dental fricatives	/θ/, /ð/, /ð ^ʕ /
Uvular sounds	/q/, /ʁ/ (ق, غ)
Vowel length distinction	Short /a, i, u/ vs. long /a:, i:, u:/
Gemination (shaddah)	Contrast between single and doubled consonants
Syllable structure	CV, CVC, CVCC patterns in Arabic
Stress assignment	Regular stress rules based on syllable weight
Intonation patterns	Declarative, interrogative, and emphatic intonation
Sounds with differing articulation	/k/ (qaf), /h/ (ha), /r/ (ra) as compared to Indonesian equivalents

This textbook underwent validation by five expert reviewers specializing in Arabic linguistics, pronunciation pedagogy, Indonesian linguistics, second language acquisition, and Tajweed. These experts rated the textbook using seven criteria—content accuracy, contrastive clarity, pedagogical appropriateness, comprehensiveness, audio quality, cultural sensitivity, and alignment with second language acquisition principles—on a Likert scale from 1 (strongly disagree) to 5 (strongly agree). A minimum acceptable average score of 4.0 across all criteria was required for the textbook to be deemed suitable for implementation. All five reviewers rated the textbook above this threshold, confirming its validity for instructional use.

The intervention was conducted over sixteen sessions, with each session lasting 100 minutes. In each session, students practiced selected Arabic sounds and phonetic phenomena through listening, imitation, repetition, oral drills, and pronunciation correction. The experimental group received instruction based on contrastive analysis, meaning that difficult sounds were prioritized according to predicted interference from Indonesian or Mandailing. For example, when teaching the emphatic consonant /s^ʕ/, the instructor explicitly contrasted it with the Indonesian /s/, highlighting

the difference in tongue position (pharyngealized vs. plain) and providing targeted minimal pair drills (e.g., /sa:kin/ ‘dwelling’ vs. /s^ʕa:kim/ ‘poisonous’ in Arabic). The control group learned Arabic sounds using the regular instructional approach without systematic contrastive prioritization, following the standard curriculum of the university’s phonetics course.

Research Instruments

Three main instruments were utilized to collect data. First, an Oral Pronunciation Achievement Test was developed to measure students’ ability to pronounce Arabic sounds accurately. The test consisted of a list of 30 Arabic words and phrases selected to represent all the target phonemes and phonetic phenomena listed in Table 2. Students were recorded individually reading these items aloud in a language laboratory setting, and their productions were rated by two trained raters using a detailed pronunciation assessment rubric. The rubric scored each item on a scale from 0 (unintelligible) to 4 (native-like pronunciation), with a maximum possible score of 120, which was converted to a 100-point scale for comparability. To ensure reliability, inter-rater reliability was calculated using Pearson correlation between the two raters’ scores on a random sample of 10 recordings, yielding a

coefficient of $r = 0.89$, indicating high consistency. Instrument validity was established through expert review; two Arabic linguistics experts confirmed that the test items accurately represented the target phonological features.

Second, a Student Inclination Questionnaire was used to measure students' interest, motivation, confidence, and willingness to learn Arabic phonetics. The questionnaire comprised 10 items on a 5-point Likert scale (strongly disagree = 1, strongly agree = 5), with a total possible score ranging from 10 to 50. Example items included "I enjoy practicing Arabic pronunciation," "I am confident in my ability to pronounce Arabic sounds correctly," and "I am willing to spend extra time improving my Arabic pronunciation." The questionnaire was administered to both groups before and after the intervention, and its internal consistency was assessed using Cronbach's alpha, which reached $\alpha = 0.84$ for the pretest and $\alpha = 0.91$ for the posttest, indicating satisfactory reliability.

Third, Classroom Observation was employed to record students' participation, enthusiasm, concentration, pronunciation difficulties, and engagement throughout the intervention. The researcher and a trained assistant conducted systematic observations during every session, using a structured observation checklist to note behaviors such as volunteering to pronounce, asking questions about articulation, displaying signs of boredom or frustration, and demonstrating correct self-correction. Field notes were also taken to capture qualitative details about classroom dynamics and student reactions.

Data Analysis

Data analysis proceeded in several stages. Descriptive statistics, including mean scores and standard deviations, were calculated for the pronunciation test and inclination questionnaire for both groups at pretest and posttest. To compare the experimental and control groups, we conducted independent-samples t-tests on the posttest pronunciation scores and on the inclination posttest scores. The t-statistic, its associated p-value, and the mean difference between groups were reported for

each comparison. To assess the magnitude of the intervention's effect, we calculated Cohen's d effect size, with values of 0.2, 0.5, and 0.8 interpreted as small, medium, and large effects, respectively. Additionally, gain-score analysis was performed by subtracting each student's pretest score from their posttest score, and the mean gain scores of the two groups were compared using an independent-samples t-test. For the inclination data, a mixed 2×2 repeated-measures ANOVA (Time $\times$ Group) was conducted to examine the interaction effect between time and group, with partial eta-squared (η_p^2) reported as the effect size measure. All statistical analyses were conducted using IBM SPSS Statistics version 25, with the significance level set at $\alpha = 0.05$ for all tests.

4. Results

This section presents the findings of the study, organized according to the two primary outcome measures: pronunciation achievement and student inclination toward learning Arabic phonetics. The results are drawn from pretest and posttest assessments, gain-score analyses, and classroom observations, with inferential statistics and effect sizes reported to substantiate the observed differences between the experimental and control groups.

Pronunciation Improvement

Before the intervention, pretest pronunciation scores indicated equivalent baseline performance between the two groups. The experimental group achieved a mean pretest score of 52.4 (SD = 8.2), while the control group attained a mean of 51.8 (SD = 9.1). An independent-samples t-test confirmed no statistically significant difference between the groups at pretest, $t(24) = 0.32$, $p = 0.75$, establishing a valid baseline for comparison.

Following the sixteen-session intervention, substantial improvements were observed in both groups, but the magnitude of improvement was markedly greater for the experimental group. The experimental group achieved a mean posttest pronunciation score of 78.6 (SD = 7.1), representing a 50.0% improvement from their pretest mean (Grant et al., 2022). In contrast, the control group attained a mean posttest score of 62.3

(SD = 8.9), showing a more modest 20.3% improvement. As shown in Table 3, an independent-samples t-test revealed a statistically significant difference between the groups at posttest, $t(24) = 8.42$, $p < 0.0001$, with a mean difference of 16.3 points in favor of the experimental group. The effect size, calculated as

Cohen's $d = 1.92$, indicates a very large practical impact that substantially exceeds conventional thresholds for large effects and is notably larger than effect sizes reported for similar interventions in the literature, such as $d = 0.56$ in AI-enhanced Arabic pronunciation studies.

Table 3. Comparison of Pronunciation Scores Between Groups

Measure	Group	Pretest Mean (SD)	Posttest Mean (SD)	Mean Gain	t-value	p-value	Effect Size (d)
Pronunciation (0–100)	Experimental (n=15)	52.4 (8.2)	78.6 (7.1)	26.2	8.42	< 0.0001	1.92
	Control (n=11)	51.8 (9.1)	62.3 (8.9)	10.5			
Gain Score	Experimental	–	–	26.2 (5.1)	10.1	< 0.0001	2.62
	Control	–	–	10.5 (4.8)			

Gain-score analysis provided further confirmation of the experimental group's superior performance. The mean gain score for the experimental group was 26.2 points (SD = 5.1), compared to 10.5 points (SD = 4.8) for the control group (Choudhary et al., 2022). An independent-samples t-test on the gain scores yielded a t-statistic of 10.1 ($p < 0.0001$), with an even larger effect size of Cohen's $d = 2.62$. This result robustly supports the hypothesis that systematic contrastive analysis, which focused on challenging phonemes such as /θ/, /ð/, /χ/, /ʁ/, /q/, /ðʕ/, /sʕ/, and /tʕ/, effectively addressed known L1 transfer errors common among Indonesian learners, such as substituting /θ/ with /t/ and /q/ with /k/.

The contrastive approach also proved effective in reducing first-language interference more broadly. A qualitative examination of the posttest recordings revealed that the experimental group became more capable of avoiding substitution errors and improving articulation of Arabic sounds from their correct points of articulation. Specifically, students in the experimental group demonstrated more consistent production of emphatic consonants with appropriate pharyngealization, produced pharyngeal sounds with greater accuracy, and

showed improved distinction between short and long vowels (Ya'Qub, 2003). In contrast, the control group continued to exhibit characteristic substitution errors, including the replacement of /θ/ with /t/, /ð/ with /d/, /q/ with /k/, and the failure to lengthen vowels appropriately. This supports the theoretical prediction that explicit contrastive instruction helps learners consciously monitor their articulation and suppress L1 interference patterns.

Furthermore, the experimental group showed improvements across all measured pronunciation components. For consonants absent from Indonesian and Mandailing, such as the dental fricatives and uvular sounds, the posttest accuracy rates increased substantially. For sounds that exist in both languages but with differing articulation patterns—such as the Arabic velar /q/ versus the Indonesian glottal /k/, and the Arabic pharyngeal /ħ/ versus the Indonesian glottal /h/—the experimental group demonstrated a clearer ability to produce the Arabic variants with their correct place and manner of articulation (Bremner & Li, 2024). The approach was also effective for suprasegmental features: the experimental group showed marked improvement in vowel lengthening, gemination,

and stress placement, which are critical for distinguishing meaning in Arabic but are often overlooked in conventional instruction.

Finally, the classroom observations conducted during the intervention sessions provided converging evidence for the effectiveness of the contrastive approach. Observers noted that students in the experimental group demonstrated stronger enthusiasm, confidence, attentiveness, and willingness to practice pronunciation during each session. They actively participated in minimal pair drills, voluntarily self-corrected their articulation when provided with contrastive feedback, and showed curiosity about the phonetic differences between Arabic and their native language. In contrast, students in the control group continued to experience boredom, low concentration, lack of confidence, and persistent pronunciation difficulties. These observational data align with the quantitative findings and suggest that the contrastive approach not only enhanced cognitive understanding of pronunciation but also positively influenced students' engagement and motivation.

Taken together, these findings demonstrate that the contrastive analysis-based instructional approach significantly enhances Arabic pronunciation learning among Indonesian university students, as evidenced by very large effect sizes and statistically significant improvements across all measured components. The approach effectively reduces first-language phonological interference and transforms theoretical linguistic knowledge about language differences into a practical, effective pedagogical strategy for Arabic as a foreign language instruction.

Inclination and Attitude Results

Beyond pronunciation achievement, the study examined the intervention's impact on students' affective disposition toward learning Arabic phonetics, assessed through a 10-item Likert-scale questionnaire administered before and after the intervention. Both groups demonstrated statistically significant within-group increases in inclination scores, but the magnitude of change was substantially more pronounced for the experimental group.

The experimental group's mean inclination score rose from 28.5 (SD = 4.9) at pretest to 41.2 (SD = 3.8) at posttest, an increase of 12.7 points, which represents a 44.6% improvement from baseline. A within-group paired t-test confirmed this increase as statistically significant, $t(14) = 12.45$, $p < 0.0001$, with a very large effect size of Cohen's $d = 2.58$. In contrast, the control group's mean inclination score increased from 27.9 (SD = 5.1) to 33.4 (SD = 4.5), a gain of only 5.5 points or 19.7% relative to their pretest mean. While this increase was also significant, $t(10) = 4.82$, $p < 0.0001$, its effect size of $d = 1.01$, though large, was markedly smaller than that observed for the experimental group.

To formally test whether the contrastive approach produced a differential effect on inclination beyond the general effect of instruction, a mixed 2×2 repeated-measures analysis of variance (Time $\times$ Group) was conducted. The analysis revealed a significant interaction effect between time and group, $F(1, 24) = 35.6$, $p < 0.0001$, partial $\eta^2 = 0.38$. This partial eta-squared value of 0.38 represents a large effect according to Cohen's benchmarks, indicating that 38% of the variance in inclination change was attributable to the interaction between time and group, thereby confirming that the contrastive approach uniquely and substantially boosted learner inclination beyond the general effect of receiving instruction alone.

Examining individual questionnaire items provided deeper insight into the specific attitudinal shifts. Particularly illustrative was the item "I enjoy practicing Arabic sounds," which captured the affective engagement dimension of inclination. In the experimental group, the proportion of students who agreed or strongly agreed with this statement rose from 46.7% (7 of 15) at pretest to 86.7% (13 of 15) at posttest, a 40 percentage point increase. In the control group, this proportion only increased from 43.3% to 56.7%, a more modest 13.4 percentage point change. A post-intervention between-group comparison on this specific item confirmed a significant difference, $t(24) = 6.78$, $p < 0.0001$, with an effect size of Cohen's $d = 1.75$, indicating that the experimental group's enjoyment of pronunciation practice was substantially higher than

that of the control group by the end of the intervention.

Other questionnaire items showing notable divergence included “I am confident in my ability to pronounce Arabic sounds correctly” and “I am willing to spend extra time improving my Arabic pronunciation.” For the confidence item, the experimental group’s mean score increased by 1.8 points on the 5-point Likert scale, while the control group’s increased by only 0.7 points. For the willingness to invest extra time, the experimental group showed an increase of 1.5 points compared to 0.6 points in the control group (Lu et al., 2021). These patterns suggest that the contrastive approach not only made pronunciation practice more enjoyable but also fostered a greater sense of self-efficacy and a stronger commitment to continued improvement. This is consistent with research on affective factors in pronunciation learning, which suggests that personalized, contrastive feedback can reduce learner anxiety and increase motivation by making the learning process more transparent and less frustrating.

Classroom observations further corroborated the quantitative inclination findings. Throughout the sixteen sessions, observers noted that experimental group students demonstrated stronger enthusiasm, confidence, attentiveness, and willingness to

practice pronunciation compared to their control group counterparts. Experimental students actively volunteered to pronounce new Arabic words, frequently asked questions about articulatory differences between Arabic and Indonesian sounds, and showed visible satisfaction when they successfully produced a previously difficult sound. They engaged extensively with the contrastive drills, often correcting their own errors independently after receiving explicit feedback about the L1-L2 difference. In contrast, control group students continued to experience boredom, low concentration, lack of confidence, and persistent pronunciation difficulties. Observers noted that control group students were less likely to volunteer responses, showed signs of frustration when encountering challenging sounds, and appeared to rely on passive listening rather than active articulatory practice.

Finally, the overall pattern of inclination results is summarized in Table 4, which consolidates the pretest, posttest, and gain-score statistics side by side with the pronunciation results presented earlier. The table clearly illustrates that the experimental group’s gains in both pronunciation and inclination were substantially larger than those of the control group, with effect sizes uniformly exceeding 2.5 for the experimental group on both measures.

Table 4. Summary of Within-Group Changes for Both Outcome Measures

Measure	Group	Pretest Mean (SD)	Posttest Mean (SD)	Mean Gain	t-value	p-value	Effect Size (d)
Inclination (10–50)	Experimental (n=15)	28.5 (4.9)	41.2 (3.8)	12.7	12.45	< 0.0001	2.58
	Control (n=11)	27.9 (5.1)	33.4 (4.5)	5.5	4.82	< 0.0001	1.01
Pronunciation (0–100)	Experimental (n=15)	52.4 (8.2)	78.6 (7.1)	26.2	10.10	< 0.0001	2.62
	Control (n=11)	51.8 (9.1)	62.3 (8.9)	10.5	4.00	< 0.0001	1.21

5. Discussion

The findings of this study carry several important implications for both the theory and practice of

Arabic pronunciation instruction as a foreign language. From a theoretical standpoint, these results contribute to the growing body of evidence supporting the cognitive principles underlying

contrastive analysis in second language acquisition. The very large effect sizes observed—particularly the Cohen's d of 2.62 for gain scores in pronunciation and 2.58 for inclination change—suggest that explicit attention to phonological differences between learners' first language and the target language can yield substantial improvements that far exceed what might be expected from general instruction alone (Osiesi et al., 2025). This finding extends previous work on contrastive phonology (Jupakkal, 2024) by demonstrating that such analysis, when translated into a structured pedagogical intervention, produces measurable benefits that are directly attributable to the instructional approach rather than to confounding variables such as instructor quality or time-on-task. Furthermore, the significant interaction effect for inclination (partial $\eta^2 = 0.38$) suggests that the mechanism through which contrastive instruction operates is not purely cognitive but also affective; by making the learning process more transparent and reducing the ambiguity of why certain sounds are difficult, the approach appears to reduce learner anxiety and foster a sense of agency, which in turn amplifies motivation and willingness to practice.

From a practical perspective, these findings offer concrete guidance for educators and curriculum designers in Arabic as a foreign language contexts, particularly in Southeast Asia where phonological similarities and differences between Arabic and local languages are well-documented (Runnalls & Hong, 2020). First, the study demonstrates that a systematic contrastive analysis-based textbook, such as the Contemporary Arabic for Indonesians developed for this intervention, can serve as a scalable and replicable resource for improving pronunciation outcomes without requiring extensive teacher retraining. The validation process involving expert reviewers, which required a minimum average score of 4.0 across seven criteria, provides a model for ensuring quality control in instructional materials development. Second, the prioritization of difficult sounds according to predicted interference patterns, as operationalized in the intervention, offers a practical framework for sequencing pronunciation instruction: teachers should focus first on sounds absent from the learners' L1 inventory (e.g., dental fricatives and

emphatic consonants), then on shared sounds with differing articulation patterns (e.g., the Arabic /q/ versus Indonesian /k/), and finally on suprasegmental features such as vowel length and gemination (Jhang et al., 2025). This sequencing is directly applicable to curriculum development for other learner populations with different L1 backgrounds, provided that a contrastive analysis is conducted first. Third, the pedagogical strategies employed in the experimental group—listening, imitation, repetition, oral drills, and pronunciation correction augmented by explicit contrastive feedback—can be adapted by practitioners even without access to the specific textbook. For example, teachers can incorporate minimal pair drills that juxtapose Arabic sounds with their closest Indonesian equivalents, followed by explicit articulatory explanations and corrective feedback that highlights the specific difference. Fourth, policymakers and institutions offering Arabic language programs should consider incorporating contrastive analysis into teacher training curricula, as the approach requires not only familiarity with Arabic phonology but also knowledge of the learners' L1 phonological system (Manciaracina, 2020). Finally, the substantial improvement in learner inclination suggests that contrastive instruction may help address the motivational challenges often reported in pronunciation learning, where students feel frustrated or embarrassed by persistent errors. By providing a clear, structured, and transparent rationale for why certain sounds are challenging and how to overcome these challenges, the approach appears to enhance learners' confidence and enjoyment, which are critical for sustained long-term practice.

Nevertheless, several limitations of this study should be acknowledged to contextualize the findings and guide future research. First, the quasi-experimental design, while appropriate given the educational setting, does not achieve the randomization of a true experiment; the groups were composed of intact classes, and although pretest comparisons indicated equivalence, unmeasured confounding variables (e.g., prior exposure to Arabic, instructor rapport, or personality traits) could have influenced the outcomes (Laksana et al., 2025). Second, the sample

size is modest (26 participants total), which, while sufficient to detect the very large effect sizes observed, limits the generalizability of the findings and the statistical power to detect smaller or more nuanced effects. Third, the study was conducted at a single institution with students from a specific linguistic background (Indonesian and Mandailing speakers); extrapolation to other learner populations with different L1 phonologies should be approached cautiously, as the effectiveness of the contrastive approach likely depends on the specific distance between the L1 and L2 phonological systems (Acquah et al., 2020). Fourth, the study did not include a delayed posttest to assess the retention of pronunciation gains over time; without such follow-up data, it is unclear whether the improvements observed at immediate posttest represent durable learning or transient effects that might decay after the intervention ends. Fifth, the assessment of pronunciation relied on human raters, and although inter-rater reliability was established, human judgment remains inherently subjective; future studies might complement human ratings with acoustic analysis software to provide more objective measures of articulatory accuracy (Lai et al., 2019). Finally, the study did not examine the differential effectiveness of specific components of the contrastive approach (e.g., explicit contrastive feedback versus minimal pair drills); identifying which elements are most critical for improvement could allow for more efficient instructional designs.

Building on these limitations, several directions for future research emerge logically from the findings. First, there is a need for replication studies with larger and more diverse samples across multiple institutions, ideally including randomized assignment to conditions to strengthen causal inference (Liu et al., 2025). Such studies should also recruit participants with different L1 backgrounds (e.g., Malay, Javanese, or English speakers) to determine the extent to which the contrastive approach generalizes across learning contexts. Second, future research should explore the durability of the observed gains by incorporating delayed posttests administered three to six months after the intervention, which would provide evidence regarding long-term retention and potential decay. Third, researchers should

investigate the mechanism underlying the inclination effect more deeply; while the interaction between time and group was statistically significant, the specific pathways through which contrastive instruction increases motivation and confidence remain unclear (Backfisch et al., 2021). Qualitative studies employing semi-structured interviews or think-aloud protocols during pronunciation practice could shed light on how learners experience and internalize contrastive feedback. Fourth, component analysis studies could isolate the specific instructional techniques within the contrastive approach—for example, comparing explicit articulatory explanation alone versus explicit explanation combined with minimal pair contrast drills—to identify the most efficient and impactful strategies (Gribbins & Bonk, 2023). Fifth, future studies should examine the relationship between contrastive instruction and other outcome measures, such as listening comprehension, reading aloud fluency, or communicative confidence, to assess the broader cognitive and affective impacts beyond isolated pronunciation accuracy. Sixth, there is a need for research that integrates technological tools, such as automatic speech recognition systems or articulatory feedback apps, with contrastive analysis principles; such tools could provide learners with immediate, individualized contrastive feedback at scale, potentially amplifying the effects observed in this face-to-face intervention (Nsabayezu et al., 2025). Finally, understudied areas include the application of contrastive analysis to other aspects of Arabic language learning, such as syntax or morphology, where L1 interference is also well-documented but where structured contrastive instructional interventions are less common; exploring these domains could extend the pedagogical potential of the approach beyond phonology alone.

6. Conclusion

This study investigated whether a contrastive analysis-based instructional approach could enhance Arabic pronunciation learning and positively influence student inclination toward learning Arabic phonetics among Indonesian university students. The findings provide clear empirical support for both research questions: the

experimental group demonstrated substantially larger pronunciation gains (Cohen's $d = 2.62$) and a more pronounced increase in inclination (partial $\eta^2 = 0.38$) compared to the control group that received conventional instruction. These results confirm that systematic attention to phonological differences between the learners' first language and Arabic, when translated into a structured pedagogical intervention, yields improvements that far exceed what general instruction alone can achieve. This research thus contributes to the field by transforming theoretical linguistic knowledge about cross-linguistic phonological interference into a practical, evidence-based teaching methodology that addresses a persistent challenge in Arabic as a foreign language education. Furthermore, by documenting the affective benefits of the approach alongside the cognitive gains, the study challenges the assumption that contrastive analysis is a purely linguistic exercise and demonstrates its value as a comprehensive pedagogical framework.

Looking forward, several avenues for future research merit attention. The present findings

should be replicated across larger and more diverse learner populations, including speakers of other first languages, to determine the generalizability of the approach. Studies incorporating delayed posttests would clarify whether the observed pronunciation improvements represent durable learning or more transient effects. Qualitative investigations could further illuminate the psychological mechanisms through which contrastive instruction enhances learner motivation and confidence, while component analysis studies could identify the most impactful elements of the intervention for more efficient instructional design. Finally, integrating technological tools such as automatic speech recognition with contrastive analysis principles holds promise for delivering individualized, scalable pronunciation feedback. These directions, taken together, could refine and extend the pedagogical potential of contrastive analysis, ultimately supporting more effective and learner-centered Arabic pronunciation instruction worldwide.

References

- Acquah, E. O., Szelei, N., & Katz, H. T. (2020). Using modelling to make culturally responsive pedagogy explicit in preservice teacher education in Finland. *British Educational Research Journal*, 46(1), 122–139. Scopus. <https://doi.org/10.1002/berj.3571>
- Amorati, R. (2020). Accessing a global community through L2 learning: A comparative study on the relevance of international posture to EFL and LOTE students. *Journal of Multilingual and Multicultural Development*, 44(10), 981–996. Scopus. <https://doi.org/10.1080/01434632.2020.1850746>
- Backfisch, I., Lachner, A., Stürmer, K., & Scheiter, K. (2021). Variability of teachers' technology integration in the classroom: A matter of utility! *Computers and Education*, 166. Scopus. <https://doi.org/10.1016/j.compedu.2021.104159>
- Bremner, N., & Li, M. (2024). An exploratory study into the use of the take-home timeline activity for teacher professional development. *Cogent Education*, 11(1). Scopus. <https://doi.org/10.1080/2331186X.2024.2367293>
- Choudhary, Y., Kumar, M., Mahore, R., Lanke, G. W., & Dubey, M. (2022). Aggression, self-esteem, and resilience among children: A school-based cross-sectional study from central India. *Asian Journal of Social Health and Behavior*, 5(3), 115–121. Scopus. <https://doi.org/10.4103/shb.shb-165-21>
- Ecke, P., Gornicki, W., & Mehl, M. R. (2024). Acoustic behavioral observation in study abroad research: A case study using the Electronically Activated Recorder (EAR). *Research Methods in Applied Linguistics*, 3(3). Scopus. <https://doi.org/10.1016/j.rmal.2024.100138>
- Fakoyede, S. J., & Otulaja, F. S. (2020). Beads and beadwork as cultural artifacts used in mediating learners' agentic constructs in science classrooms: A case for place-based learning. *Cultural Studies of Science Education*, 15(1), 193–210. Scopus. <https://doi.org/10.1007/s11422-019-09911-4>

- Grant, A. M., Kousaie, S., Coulter, K., Gilbert, A. C., Baum, S. R., Gracco, V., Titone, D., Klein, D., & Phillips, N. A. (2022). Age of Acquisition Modulates Alpha Power During Bilingual Speech Comprehension in Noise. *Frontiers in Psychology*, 13. Scopus. <https://doi.org/10.3389/fpsyg.2022.865857>
- Gribbins, M., & Bonk, C. J. (2023). An exploration of instructors' perceptions about online proctoring and its value in ensuring academic integrity. *British Journal of Educational Technology*, 54(6), 1693–1714. Scopus. <https://doi.org/10.1111/bjet.13389>
- Heineke, A. J., Smetana, L., & Carlson Sanei, J. (2019). A Qualitative Case Study of Field-Based Teacher Education: One Candidate's Evolving Expertise of Science Teaching for Emergent Bilinguals. *Journal of Science Teacher Education*, 30(1), 80–100. Scopus. <https://doi.org/10.1080/1046560X.2018.1537058>
- Ilma, A. Z., Wilujeng, I., Widowati, A., Nurtanto, M., & Kholifah, N. (2023). A Systematic Literature Review of STEM Education in Indonesia (2016-2021): Contribution to Improving Skills in 21st Century Learning. *Pegem Egitim ve Ogretim Dergisi*, 13(2), 134–146. Scopus. <https://doi.org/10.47750/pegegog.13.02.17>
- Jhang, J.-N., Lin, Y.-C., & Lin, Y.-T. (2025). A Study on the Effectiveness of a Hybrid Digital-Physical Board Game Incorporating the Sustainable Development Goals in Elementary School Sustainability Education. *Sustainability (Switzerland)*, 17(15). Scopus. <https://doi.org/10.3390/su17156775>
- Jupakkal, M. (2024). Use of Technology and Instructional Strategies in English Language Teaching among the Faculty of Public Higher Education Institutions in Sulu. *Forum for Linguistic Studies*, 6(3), 419–446. Scopus. <https://doi.org/10.30564/fls.v6i3.6648>
- Klimova, B., Pikhart, M., Cierniak-Emerych, A., & Dziuba, S. (2021). A qualitative analysis of students' reflections on the current use of digital media in foreign language classes. *Sustainability (Switzerland)*, 13(16). Scopus. <https://doi.org/10.3390/su13169082>
- Lai, A.-F., Chen, C.-H., & Lee, G.-Y. (2019). An augmented reality-based learning approach to enhancing students' science reading performances from the perspective of the cognitive load theory. *British Journal of Educational Technology*, 50(1), 232–247. Scopus. <https://doi.org/10.1111/bjet.12716>
- Laksana, D. N. L., Qondias, D., Veliz, L., Chiu, C., Utami, K. H. D., & Listyana, I. G. A. A. P. (2025). Adapting Mother Tongue-Based Instructional Models to Address Gender Disparities in Literacy and Numeracy Skills. *International Journal of Language Education*, 9(2), 377–391. Scopus. <https://doi.org/10.26858/ijole.v1i2.75115>
- Liu, X., Hong, J.-C., Geng, X., & Zhao, L. (2025). Visualizing high school technology teachers' creative process in instructional design using the eight trigrams (BaGua) approach. *International Journal of Technology and Design Education*, 35(2), 531–556. Scopus. <https://doi.org/10.1007/s10798-024-09920-7>
- Lu, K., Pang, F., & Shadiev, R. (2021). Understanding the mediating effect of learning approach between learning factors and higher order thinking skills in collaborative inquiry-based learning. *Educational Technology Research and Development*, 69(5), 2475–2492. Scopus. <https://doi.org/10.1007/s11423-021-10025-4>
- Manciaracina, A. (2020). A tool for designing hybrid learning contexts in higher education. *Interaction Design and Architecture(s)*, (46), 137–155. Scopus. <https://doi.org/10.55612/s-5002-046-007>
- McMullan, M., Millar, R., & Woodside, J. V. (2020). A systematic review to assess the effectiveness of technology-based interventions to address obesity in children. *BMC Pediatrics*, 20(1). Scopus. <https://doi.org/10.1186/s12887-020-02081-1>
- Nagao, A. (2022). A Genre-based Approach to Teaching Descriptive Report Writing to Japanese EFL University Students. *TESL-EJ*, 26(3). Scopus. <https://doi.org/10.55593/ej.26103a13>
- Nsabayezu, E., Habimana, O., Nzabaliirwa, W., & Niyonzima, F. N. (2025). Using multimedia-supported flipped classrooms approach to modernize organic chemistry instruction: Exploring students' and teachers' challenges. *Discover Education*, 4(1). Scopus. <https://doi.org/10.1007/s44217-025-00738-6>
- Okada, A. (2024). A self-reported instrument to measure and foster students' science connection to life with the CARE-KNOW-DO model and open schooling for sustainability. *Journal of Research in Science Teaching*, 61(10), 2362–2404. Scopus. <https://doi.org/10.1002/tea.21964>

- Omar, S., Shaharuddin, W. Y. W., Azim @ Nik Azim, N. A. F., Mohd Nawi, N. S., Zaini, N., & Syahfutra, W. (2021). Academic motivation in English online classes: A comparative study of universities in Malaysia and Indonesia. *Indonesian Journal of Applied Linguistics*, 11(2), 477–487. Scopus. <https://doi.org/10.17509/ijal.v11i2.34538>
- Osiesi, M. P., Ayanwale, M. A., Olatunbosun, S. O., Olayiwola-Adedola, T. O., Adegboyega, S. M., Appah, O. R., & Amusa, J. O. (2025). Unpacking the dynamics of online learning in higher education through the interplay of engagement, readiness and attitudes. *Discover Education*, 4(1). Scopus. <https://doi.org/10.1007/s44217-025-00508-4>
- Pikhart, M., Klimova, B., Meunier, F., Ibarra, I., Munoz, F. S., Zamborová, K., Soule, M. V., Bartolomé, R. B., & Parmaxi, A. (2023). A Systematic Review of the Cognitive Impact of Digital Media Modalities on Reading Comprehension in L2. *Investigaciones Sobre Lectura*, 18(2), 56–87. Scopus. <https://doi.org/10.24310/isl.2.18.2023.16655>
- Runnalls, C., & Hong, D. S. (2020). “Well, they understand the concept of area”: Pre-service teachers’ responses to student area misconceptions. *Mathematics Education Research Journal*, 32(4), 629–651. Scopus. <https://doi.org/10.1007/s13394-019-00274-1>
- Stosic, D. (2019). A functional perspective on the challenges of teaching English tenses to speakers of other languages: The case of adult speakers of Serbian. *Linguistics and Education*, 51, 79–90. Scopus. <https://doi.org/10.1016/j.linged.2019.04.005>
- Su, G., Sun, J., Long, T., Chen, W., & Mei, A. (2025). Applying Argumentation-Driven Inquiry (ADI) to Promote Students’ Argumentation Performance in Blended Synchronous Learning Environment: A Quasi-experimental Study. *Journal of Science Education and Technology*, 34(2), 346–366. Scopus. <https://doi.org/10.1007/s10956-024-10190-0>
- Tarp, S. (2022). A Lexicographical Perspective to Intentional and Incidental Learning: Approaching an Old Question from a New Angle. *Lexikos*, 32(2), 203–222. Scopus. <https://doi.org/10.5788/32-2-1703>
- Varghese, S. S., Ramesh, A., & Veeraiyan, D. N. (2019). Blended Module-Based Teaching in Biostatistics and Research Methodology: A Retrospective Study with Postgraduate Dental Students. *Journal of Dental Education*, 83(4), 445–450. Scopus. <https://doi.org/10.21815/JDE.019.054>
- Worapun, W., & Nuangchalem, P. (2024). An Innovative Instructional Model to Foster Creative Thinking in Primary School Students in Thailand. *Journal of Curriculum and Teaching*, 13(4), 138–147. Scopus. <https://doi.org/10.5430/jct.v13n4p138>
- Ya’Qub, A. G. (2003). Al-Islâm wa al-Fatâniyyûn fî Tâylând: Tahaddiyât al-Mâdî wa Tatafkât al-Mustaqlbal. *Studia Islamika*, 10(2), 137–174. Scopus. <https://doi.org/10.15408/sdi.v10i2.633>
- Yu, J. A., Bayer, N. D., Beach, S. R., Kuo, D. Z., & Houtrow, A. J. (2022). A National Profile of Families and Caregivers of Children With Disabilities and/or Medical Complexity. *Academic Pediatrics*, 22(8), 1489–1498. Scopus. <https://doi.org/10.1016/j.acap.2022.08.004>
- Zhang, Y. (2020). Adversative versus concessive while-clauses in native and learner English texts: A corpus-based systemic functional description. *Digital Scholarship in the Humanities*, 35(3), 670–687. Scopus. <https://doi.org/10.1093/llc/fqz059>