

The Effects of Guided Discovery Learning and Test-Teach-Test on Iranian Intermediate EFL Learners' Grammatical Knowledge

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Abstract

The success of various grammar-teaching approaches remains one of the key concerns in second language education. This study investigated the relative effects of Guided Discovery Learning (GDL) and Test–Teach–Test (TTT) in the development of grammatical knowledge among intermediate Iranian EFL learners, particularly in the acquisition of tense and article systems. A quasi-experimental pretest–posttest design was adopted, in which two intact classes ($N = 34$) were randomly assigned to GDL and TTT conditions. The two groups received sixteen instructional sessions delivered by the same teacher using parallel teaching materials. Grammatical knowledge was assessed using researcher-developed pretests and posttests created according to the institute's curriculum requirements. ANCOVA analysis, controlling for pretest scores, revealed that while both groups made significant gains, the GDL group had higher posttest scores ($F(1, 31) = 12.40, p = .001, \eta p^2 = .34$). These results indicate that inductive, learner-focused approaches to instruction may result in greater gains in grammar mastery than structured diagnostic teaching cycles. The results of this study demonstrate the possible benefit of guided discovery in EFL contexts. Future studies could build on the findings of this study by using larger samples and investigating the effectiveness of these approaches in technology-mediated learning environments.

Keywords: form-focused instruction; grammar acquisition; guided discovery learning; Iranian EFL learners; test–teach–test

1 Introduction

Grammar instruction has remained one of the most enduring issues facing second language acquisition, especially in communicative EFL classrooms where the learners may possess sufficient grammatical knowledge but struggle to apply it appropriately and fluently in communication. This phenomenon has been prominently noted in the Iranian EFL context, where grammar instruction has traditionally focused on the explanation of grammatical rules and the importance of accurate written grammar use. Consequently, Iranian EFL learners often possess sufficient declarative knowledge but

struggle to make significant gains in the control of grammar use in spontaneous communication (Lightbown & Spada, 2021).

According to cognitive and interactionist theories of second language acquisition, grammar instruction should not focus on the explanation of grammatical rules but should actively involve the learners in the process of noticing, testing, and processing the grammar input, and eventually transforming it into fluency (Ellis, 2019; Spada & Tomita, 2010). Nevertheless, there are still no clear indications of the most appropriate grammar instruction techniques for facilitating the development of grammar use in communicative EFL classrooms.

Of these form-focused models, Test–Teach–Test (TTT) and Guided Discovery Learning (GDL) have received much attention as two prominent but distinct approaches. TTT is centered on diagnostic cycles where the learners' initial performance influences the teaching and practice that follow (DeKeyser & Criado, 2013). GDL, on the other hand, promotes active discovery of grammatical rules by learners through structured input, an approach grounded in constructivist and cognitive learning theories, which fosters greater engagement and more enduring learning (Alfieri et al., 2011; Janssen et al., 2014). While both approaches integrate explicit and implicit learning, they do so in different ways, depending on the role of attention to form and the learner's responsibility for learning.

Despite the growing interest in the application of such techniques, there are limited direct comparisons between the techniques, especially in EFL classrooms where the learners continue to face problems with the grammar of tenses and articles. These areas are of special concern for Persian EFL learners since there are no articles in the Persian language similar to those used in English, and the way of forming tenses and other aspects of the verb are different. Such differences often result in the occurrence of problems such as the omission, overuse, and misuse of grammatical forms. Most of the studies focused on the application of TTT and GDL individually, but only a few studies compared the techniques under controlled conditions (Shangarffam & Hosseini, 2018). It is not clear yet which of the techniques can facilitate the development of more stable and transferable grammar for the learners.

From the perspective of Skill Acquisition Theory, DeKeyser (2020) explained that the learning of grammar involves a gradual shift from the knowledge of grammar rules to the automatic use of those rules. Following this perspective, it is hypothesized that GDL would facilitate a deeper restructuring of learners' interlanguage through inductive cognitive engagement, while TTT would merely help learners achieve faster and temporary accuracy through its cycles of diagnosis.

The present study, therefore, investigated the differential effects of GDL and TTT on the grammatical development of intermediate-level Iranian EFL learners, with a focus on the use of tenses and articles in sixteen sessions of instruction. By comparing these two highly cited grammar instruction models, the study aimed to contribute empirical evidence to ongoing discussions of effective grammar instruction in EFL contexts. Thus, the following research question was formulated: To what extent does Guided Discovery Learning, compared with Test–Teach–Test instruction, influence the grammatical knowledge of intermediate Iranian EFL learners?

2 Literature Review

2.1 Grammar Teaching in Second Language Acquisition

Grammar is the core aspect of second language acquisition since it is the vehicle that enables the learner to create meaningful and accurate expressions. Although communicative approaches to second language acquisition, especially in the early days, de-emphasized the teaching of grammar (Krashen, 1982), more recent studies have confirmed its significance in the accuracy and ultimate success of second language acquisition (Ellis, 2006; Swain, 2005). These days, the study of grammar is viewed as a fluid construct that connects the forms, meanings, and uses of language (Larsen-Freeman, 2020). In this light, the teaching of grammar is seen as the facilitation of its proceduralization, or the automatic and meaningful use of grammar (DeKeyser, 2020).

Research has shown that the neglect of grammar instruction and overreliance on mechanical practice can impede second language acquisition. Learners exposed only to communicative activities often develop fossilized errors, whereas those restricted to mechanical exercises rarely achieve fluency (Loewen & Sato, 2024). Therefore, modern SLA emphasizes form-focused instruction (FFI), which integrates attention to form within meaningful communication (Nassaji & Kartchava, 2020; Spada, 2021). The issue is not whether grammar should be taught, but how to balance explicit and implicit exposure to achieve optimal learning.

2.2 Explicit, Implicit, and Form-Focused Approaches to Grammar Instruction

The dichotomy of explicit versus implicit learning continues to play an important part in grammar pedagogies because of its implications for differences in learners' awareness, attentional focus, and accessibility of knowledge in performance contexts. Explicit learning approaches emphasize learners' conscious awareness of rules, metalinguistic awareness, and intentional practice in grammar learning, resulting in declarative knowledge that may lay the groundwork for further proceduralization in later usage contexts (Ellis, 2009).

Research based on meta-analytic approaches to studying learning outcomes in second language development has consistently supported both explicit and implicit learning approaches in grammar instruction as effective in promoting second language learning outcomes, although their relative efficacy varies as a function of learners' proficiency levels, complexity of structure to be learned, salience of structure in input or practice, and measurement of learning outcomes used in assessment (Norris & Ortega, 2000).

However, more recent pedagogical research has stressed the need to ensure that the most lasting grammatical growth is achieved by embedding attention to grammatical forms within meaning-focused communicative activities, as opposed to the more traditional approach of practicing rules in isolation. Such an approach is referred to as the framework of Form-Focused Instruction (FFI) (Spada, 2021).

Explicit instruction has been found to bring about rapid gains in the controlled use of grammatical forms, especially at the initial and intermediate stages of language proficiency; however, communicative practice is required to consolidate these gains and ensure stability and transfer to communicative contexts (DeKeyser, 2020). By contrast, implicit learning tends to facilitate fluency but may also allow learners to retain non-target-like forms unless feedback is provided (Nassaji & Kartchava, 2020). Consequently, more recent SLA research has increasingly supported instructional

models that integrate planned and incidental attention to form within communicative instruction to promote both fluency and accuracy.

2.3 Deductive and Inductive Grammar Instruction

More recent pedagogical approaches have shifted from purely rule-based learning toward more balanced models of form and meaning that maintain learner engagement. A common distinction in grammar pedagogy is between deductive and inductive approaches to grammar instruction. Deductive instruction involves presenting learners with grammatical rules prior to practice and can be effective when rules are contextualized through meaningful examples, particularly for learners who benefit from explicit metalinguistic explanation (Ellis, 2006). In contrast, inductive instruction requires learners to infer grammatical rules from structured input and has been associated with deeper cognitive processing, increased noticing, and improved retention as reported in prior research (Alfieri et al., 2011).

Two instructional models exemplify these approaches. The Test–Teach–Test (TTT) model is a diagnostic instructional cycle in which learners first attempt a communicative task, receive targeted instruction based on identified gaps in performance, and then complete a similar task to consolidate learning (Harmer, 2007). Guided Discovery Learning (GDL), by contrast, represents an inductive model in which learners analyze linguistic input, formulate hypotheses about grammatical rules, and test these hypotheses through guided feedback and teacher scaffolding (Janssen et al., 2014). While both models are grounded in form-focused instruction, they differ in sequencing, timing of explicit explanation, and degree of learner control.

Within broader communicative frameworks, Task-Based Language Teaching (TBLT) and Communicative Language Teaching (CLT) further illustrate how grammar can be effectively integrated into meaningful interaction. Empirical studies have shown that task-based instruction enhances grammatical accuracy and fluency by engaging learners in planning, negotiation of meaning, and feedback during task performance (Ellis, 2003). Similarly, CLT environments that incorporate systematic form-focused feedback have been found to promote learners' grammatical awareness, motivation, and willingness to modify their output (Lyster & Ranta, 1997). Collectively, these models suggest that grammar acquisition is most effectively supported when cognitive engagement, communicative interaction, and feedback interact within instructional design.

2.4 Theoretical Underpinnings: Skill Acquisition and Cognitive Interaction

From this perspective, grammatical development involves providing learners with opportunities to use and refine their grammatical knowledge in communicative contexts, thereby making rule-based knowledge increasingly accessible and fluent in use. From a cognitive-interactionist standpoint, this developmental process is further supported through noticing and hypothesis testing. Learners need to become aware of mismatches between their intended meanings and the linguistic forms they produce, and to use interaction and feedback to modify their interlanguage representations (Swain, 2005).

TTT and GDL can be interpreted within this framework. In the TTT model, the initial test phase creates opportunities for noticing gaps in performance, while the subsequent teach–retest cycle supports the proceduralization of grammatical knowledge. In contrast, GDL engages learners more directly in inductive reasoning and hypothesis testing, encouraging deeper cognitive engagement and more substantial modification of interlanguage representations (Janssen et al., 2014).

Higher levels of cognitive engagement have been associated in prior research with stronger retention and greater transfer of grammatical knowledge to spontaneous communication (Swain, 2005). This provides a theoretical rationale for the expectation that discovery-oriented instructional models may support more sustained grammatical development than exclusively teacher-fronted approaches.

2.5 Empirical Research on Test–Teach–Test

TTT has been characterized as a dynamic, diagnostically guided instructional cycle that allows teachers to respond to learners' emerging needs (Harmer, 2007). Research on form-focused instructional cycles indicates that this type of targeted diagnostic instruction can lead to measurable gains in grammatical accuracy by drawing learners' attention to discrepancies between form and meaning (Spada & Tomita, 2010).

From a cognitive-interactionist perspective, the initial “test” phase of TTT functions as an elicitation stage that promotes noticing by making performance gaps salient to learners. In addition, the cyclical structure of the model facilitates feedback provision, output modification, and consolidation of form–meaning connections (Lyster & Ranta, 1997), all of which align with theoretical accounts emphasizing the role of feedback and output in grammatical development (Schmidt, 2010).

Nevertheless, the effectiveness of TTT appears to depend heavily on how feedback is provided. Harmer (2007) cautions that when the “teach” phase becomes overly explicit or teacher-fronted, learner engagement may be reduced, potentially limiting deeper interlanguage restructuring. Although TTT is often effective in promoting gains in grammatical accuracy, its contribution to sustained grammatical development and transfer to spontaneous use remains less clearly established.

2.6 Empirical Research on Guided Discovery Learning

GDL is grounded in constructivist and sociocultural perspectives and emphasizes learners' active involvement in the construction of grammatical knowledge. Empirical research has documented the pedagogical benefits of discovery-oriented instruction across a range of learning contexts, particularly with respect to retention and transfer as reported in previous studies (Alfieri et al., 2011). Research on GDL further indicates that learners' inductive analysis of linguistic data promotes increased cognitive engagement, interaction, and attentional focus during grammar learning (Janssen et al., 2014; Swain, 2005).

In EFL contexts, studies grounded in form-focused and consciousness-raising approaches have reported that GDL can enhance learners' grammatical accuracy and engagement through interaction and instructional support (Ellis, 2002). Previous research has also pointed to the benefits of GDL for grammar learning, particularly with respect to retention and transfer as reported in the literature, as well as its potential to encourage hypothesis testing, learner autonomy, and the mapping of form and meaning (Janssen et al., 2014).

The effectiveness of GDL has largely been attributed to its exploratory and hypothesis-driven nature, which promotes deeper cognitive processing and sustained attention to form–meaning relationships. At the same time, it is important to acknowledge that effective implementation of GDL requires careful task sequencing and appropriate teacher scaffolding in order to prevent cognitive overload and inaccurate generalizations, thereby ensuring the accuracy and stability of developing grammatical representations (Swain, 2005). Consequently, understanding the balance between learner

autonomy in GDL and the diagnostic support offered by models like TTT is essential for developing effective grammar pedagogy.

2.7 Comparative Perspectives and Research Gap

Both TTT and GDL incorporate explicit and implicit dimensions of instruction by combining communicative activity, attention to form, and feedback. However, the two approaches differ substantially in their sequencing and degree of learner control. In the TTT model, instruction begins with learner performance, followed by diagnostic explanation and immediate re-performance (Harmer, 2007). GDL, by contrast, begins with learners' engagement with structured input and proceeds through hypothesis formulation prior to consolidation (Janssen et al., 2014).

Existing research reveals that instructional approaches emphasizing explicit features of instruction tend to support immediate gains in grammatical accuracy, whereas discovery-oriented approaches are more often associated in prior research with benefits related to retention, transfer, and cognitive engagement (Alfieri et al., 2011; Spada & Tomita, 2010). Despite these findings, direct experimental comparisons of the two approaches remain limited, particularly classroom-based studies that control for instructional materials, instructional time, and teacher effects—conditions that are necessary for isolating the impact of instructional approach.

Moreover, few investigations have examined the differential effects of these instructional techniques on the development of specific linguistic structures, such as tense and article systems. These areas have been shown to be particularly challenging for Persian EFL learners due to fundamental differences between the L1 and L2 in the domains of temporality and definiteness (Ellis, 2006; Ionin et al., 2004). In addition, there remains a lack of empirical research examining the implementation of TTT and GDL in intact classroom settings that approximate real instructional contexts while simultaneously presenting methodological challenges.

The present study addresses these gaps by offering a comparative examination of the effects of GDL and TTT instruction on the grammatical development of intermediate Iranian EFL learners. Drawing on Skill Acquisition Theory and attention-based models of second language learning, the study seeks to determine whether inductive guided discovery instruction leads to greater grammatical development than diagnostically driven explicit instruction.

3 Research Questions

The main focus of this study is to examine the effects of guided discovery learning and test-teach-test on Iranian intermediate EFL learners' grammatical knowledge. Thus, the following research question is pursued.

To what extent does Guided Discovery Learning, compared with Test–Teach–Test instruction, influence the grammatical knowledge of intermediate Iranian EFL learners?

4 Method

4.1 Participants

Thirty-four intermediate learners (15–19 years old) participated on a voluntary basis. Since all participants were already enrolled in the same proficiency level at the institute, no additional placement

test was administered; their enrollment in this level served as an initial indicator of comparable proficiency. As an added check, instructors confirmed homogeneity based on recent exam records. The TTT class comprised 18 females and the GDL class 16 male students; gender distribution happened incidentally and was therefore not considered analytically relevant. Instruction took place over two consecutive months in regular 90-minute sessions, twice a week, covering equivalent units from the institute syllabus.

As pointed out by a power analysis using G*Power 3.1 ($\alpha = .05$, $f = .25$, desired power = .80), a minimum of 28 participants were required to detect a medium effect; therefore, the obtained sample was adequate ($N = 34$).

4.2 Instruments and Materials

Grammatical knowledge of tenses and articles was measured by an identical grammar achievement test administered as both pre- and post-test to ensure direct comparability of gains. The test comprised 34 multiple-choice items adapted from the institute's curriculum. To ensure content validity, the items were reviewed by two TEFL experts for accuracy, clarity, and level appropriateness, resulting in 94% agreement. The instrument was piloted with a separate group of 20 learners at a slightly higher level. Following the pilot, item analysis was performed to refine the test. The B-index was calculated for each item to evaluate its discriminative power between masters and non-masters, using a predetermined cut-off score of 1⁹. Items with a B-index outside the acceptable range (0.37 to 0.62) were revised or replaced. Furthermore, the Kappa coefficient yielded a value of approximately .80, indicating high classification consistency. The pilot data also showed satisfactory internal consistency (Cronbach's $\alpha = .87$). To minimize practice effects, a substantial eight-week interval was maintained between the two administrations.

To ensure input and vocabulary parity between conditions, both groups were exposed to the same textbook units (Units 5–6, Project: Intermediate). Instructional materials, including slides, prompts, and tasks, were strictly standardized across groups. The only systematic difference between the two treatments was the pedagogical sequencing and delivery, which was adjusted to align with the theoretical logic of either TTT or GDL.

4.3 Research Design

This paper employed a quasi-experimental pretest–posttest design to compare the effectiveness of TTT and GDL in enhancing Iranian EFL learners' grammatical achievement. Two intact intermediate classes were selected from the same private institute in Tehran to maintain ecological validity. To mitigate potential selection bias at the group level, the two intact classes were randomly assigned to the treatment conditions (either TTT or GDL).

The independent variable was the instructional approach, whereas the dependent variable was the learners' grammatical gain, as defined by performance difference between pre- and posttests. Each class was administered sixteen sessions (eight weeks) of instruction. In order to control for teacher effects, the same instructor administered both treatments based on the identical curricular content and pacing. Analyses were conducted with the understanding that the design reflects classroom-level effects, rather than fully independent individual observations, since learners were nested within the two intact classes.

4.4 Procedure

The entire experiment was designed to unfold over three consecutive stages: Baseline Testing, Instructional Treatment, and Posttest.

Week 1: Pretesting: All participants completed the pre-test under standardized examination conditions. No feedback was given to the participants to prevent learning effects during the examination.

Weeks 1-8: Instructional Phase: The participants took part in sixteen instructional sessions spread over an eight-week period, with each session lasting 90 minutes, twice a week. The TTT and GDL groups were taught according to the respective pedagogical frameworks of each approach, following the design of the lessons. The same contact hours, grammar content, and materials were used for both groups, but the approach was different according to the design of the treatment.

Week 8: Posttest: At the end of the instructional treatment, the identical version of the grammar test was given to the participants as the post-test under the same conditions as the pre-test.

All the answer sheets were double-coded by two raters following the standardized scoring rubric designed for the purposes of the study. The reliability of the codings was high, with an inter-rater reliability of $r = .93$. Any scoring differences of more than one point were resolved by discussion and consensus.

Prior to inferential analyses, statistical assumptions for ANCOVA were examined. Tests of normality, linearity, and homogeneity of regression slopes were met (Kolmogorov–Smirnov $p > .05$; Levene's $p > .10$), confirming the suitability of the data for parametric analysis.

4.5 Instructional Conditions

4.5.1 Test–Teach–Test (TTT)

Instruction in the TTT group followed Harmer's (2007) diagnostic instructional cycle. Each grammar target was introduced through an initial communicative task (Test 1) designed to elicit learners' spontaneous use of the target structure and reveal existing interlanguage representations. Learner output was analyzed by the instructor to identify common errors and developmental gaps.

This was followed by the Teach phase, during which focused instruction was provided. Instruction consisted of brief rule clarification, exemplification, and guided practice activities aimed at highlighting form–meaning relationships and addressing observed errors. Corrective feedback was provided through prompts, reformulations, and clarification requests to promote noticing and repair.

The cycle ended with a parallel communicative task (Test 2) where the target structure was reused in a different but related context. This phase allowed for immediate consolidation and refinement of performance.

4.5.2 Guided Discovery Learning (GDL)

The GDL group received instruction in an inductive and learner-centered manner. Each lesson started with input in the form of texts, dialogues, or short videos embedding the target grammatical structure in a context. The learners were given guided discovery worksheets where they needed to observe language use, spot recurring patterns, compare examples, and make hypotheses about grammatical rules.

The teacher support came in the form of concept-checking questions and minimal metalinguistic explanation, where the learners were encouraged to refine their hypotheses collaboratively. The learners were given explicit confirmation only after they had tried to articulate rule generalizations. Finally, the learners were asked to apply the hypotheses about the rules in communicative production tasks like role plays, dialogue writing, and short written tasks.

4.6 Data Analysis

All data were double-entered and then cross-verified. Pre/post parallelism and item discrimination indices were assessed to confirm the suitability of the items prior to statistical analyses. Outliers were screened using ± 2.5 SD thresholds; no extreme scores were excluded. The dataset was analyzed in SPSS v.29. Descriptive statistics, independent-samples t-tests, and ANCOVA-with pretest as covariate-were conducted to compare posttest means. Effect sizes-both η^2 and Hedges' g were calculated to estimate the magnitude of differences, and 95% CIs were reported for all key outcomes.

5 Results

5.1 Preliminary Analysis

An independent-samples t-test was performed to verify whether the two intact classes were significantly different on grammatical knowledge prior to the instructional treatment. It was important to verify the equivalence of the pre-test scores of the two classes to ensure that the differences obtained post-instruction were not related to pre-existing differences in proficiency levels.

Levene's test verified the homogeneity of variances between the two classes, $F(1, 32) = 1.94, p = .17$. This verified the statistical comparability of the pre-test score variances between the two classes. As Table 1 illustrates, the results of the independent-samples t-test revealed that there was no significant difference between the GDL group's pre-test scores ($M = 21.16, SD = 4.03$) and the TTT group's pre-test scores ($M = 20.45, SD = 4.00$), $t(32) = -0.60, p = .55$. The negligible difference between the two classes' pre-test scores ($M_{diff} = 0.71$) and the similar standard deviations of the pre-test scores of the two classes provide further support for the similarity of the pre-test scores of the GDL and the TTT classes.

Table 1

Independent-Samples T-Test for the TTT and GDL Groups in the Pretest Stage

Group	M	SD	t	df	p (2-tailed)	Levene F	Levene p
TTT (n = 18)	20.45	4.00	-0.60	32	.55	1.94	.17
GDL (n = 16)	21.16	4.03	-0.60	32	.55	1.94	.17

5.2 Descriptive Statistics for the Posttest

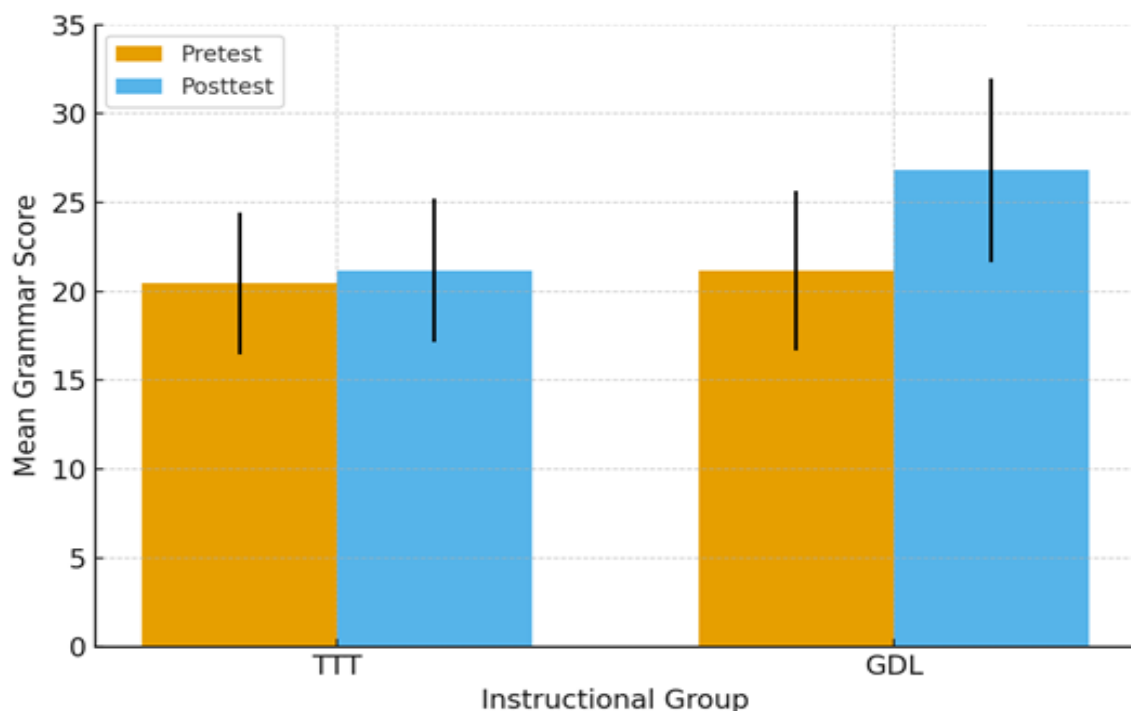
After sixteen sessions of instruction, both groups improved, but the magnitude of gain differed substantially. As shown in Table 2, the GDL group attained a higher posttest mean, $M = 26.81, SD = 5.15$, compared to that of the TTT group, $M = 21.17, SD = 4.03$. The GDL distribution showed a negative skew, -1.27 , indicating clustering at the higher end of performance.

Table 2*Descriptive Statistics for Posttest Grammar Scores*

Group	N	Min	Max	M	SD	Skewness
GDL	16	13	34	26.81	5.15	-1.27
TTT	18	13	28	21.17	4.03	-0.26

Figure 1 illustrates the mean pre- and posttest scores. Both cohorts show upward progress, but the GDL group's posttest bar is markedly higher, reflecting a stronger instructional effect.

(Mean pretest and posttest grammar scores for the TTT and GDL groups; error bars = 95 % CI.)

Figure 1*Mean Pretest and Posttest Scores for TTT and GDL Groups***5.3 Inferential Analysis**

Before carrying out the inferential statistics, all the assumptions for carrying out ANCOVA were checked. The results showed that the distribution of the data was not significantly different from a normal distribution (K-S $p > .05$), that the variances of the instructional groups did not differ significantly (Levene $F(1, 30) = 0.31, p = .59$), and that the assumption of homogeneity of regression slopes was met ($p = .47$).

A one-way ANCOVA (Table 3) was carried out on the posttest results, where the independent variable was the instructional group (TTT and GDL), and the pretest results were entered as a covariate. The overall ANCOVA was found to be significant, $F(2, 31) = 9.31, p < .001$. The ANCOVA accounted for 38% of the variance in the posttest results ($R^2 = .38$; adjusted $R^2 = .34$), showing that the initial

knowledge of grammar and the instructional methods combined accounted for a significant portion of the post-instructional performance of the learners.

The pretest covariate also proved to be a significant predictor of posttest outcomes: $F(1, 31) = 4.43$; $p = .04$; $\eta_p^2 = .13$. This confirms that learners' initial grammatical competence indeed played a crucial role in shaping their final outcomes. However, as may be seen from the above findings, when accounting for these initial differences, the main effect of instructional group proved to be very significant: $F(1, 31) = 12.40$; $p = .001$; $\eta_p^2 = .34$; 95% $CI = .15$ to $.52$. This effect size indicates that learners' instructional condition accounted for 34% of the variance in learners' posttest outcomes—a figure that may be deemed substantial in an educational context.

The adjusted means for both groups also reveal an important fact: learners in the GDL group scored significantly higher on their adjusted posttest means than learners in the TTT group: $M = 26.4$; $SE = 0.78$ vs. $M = 21.3$; $SE = 0.75$; adjusted group difference = 5.1; $p = .001$.

This difference in learners' outcomes may also be deemed significant from a statistical point of view: Hedges' $g = 1.02$; 95% $CI = 0.45$ to 1.58 . Together, these results provide strong empirical evidence that Guided Discovery Learning produced significantly greater grammatical gains than the Test–Teach–Test approach when controlling for initial proficiency.

Table 3

ANCOVA Results for Posttest Scores (Pretest as Covariate)

Source	SS	df	MS	F	p	Partial η_p^2
Pretest (covariate)	84.33	1	84.33	4.43	.04	.13
Group	236.21	1	236.21	12.40	.001	.34
Error	590.61	31	19.05			

6 Discussion

The present study explored whether GDL and TTT differently affected tense and articles grammatical knowledge in Iranian EFL learners. As expected, results indicated significant gain from pretest to posttest in both groups, providing documentation that inductive and diagnostic explicit attention to form can be effective in promoting grammar development in communicative classrooms.

However, the GDL group outperformed the TTT group with a large effect size, $\eta_p^2 = .34$, $g = 1.02$, showing that inductive, learner-centered instruction resulted in deeper and more robust learning gains. These results go beyond the existing evidence on form-focused instruction to date, in that they show how cognitively engaging discovery processes can yield superior results compared with teacher-led cycles of testing and explanation, even when both approaches are provided under equivalent conditions by the same instructor.

The combined descriptive and inferential findings suggest that there were significantly more grammatical gains in the GDL than in the TTT approach. On average, the learners in the GDL group scored better than those in the TTT approach by about five points on the posttest, which is a large and educationally significant difference. This trend indicates that the inductive and learner-centered approach of GDL was more conducive to effective grammatical development under the instructional conditions of the current study.

Since intact classes were used as the units of analysis, the results should be considered in terms of classroom-level trends rather than strictly individual causal influences. However, the consistency and magnitude of the observed differences highlight that the instructional design of GDL probably facilitated deeper cognitive processing and more stable restructuring of the learners' interlanguage representations. In GDL, learners were required to actively participate in the observation, hypothesis formation, and verification of form-meaning relationships rather than simply accepting explanations of grammatical rules.

In contrast, while TTT appeared to support short-term accuracy by directing attention to errors and providing immediate corrective feedback, it may have offered fewer opportunities for sustained hypothesis testing and generative processing. As a result, learning under TTT may have remained more dependent on explicit instruction and less readily transferable to independent communicative use. The results highlight that discovery-based instructional sequences can foster more robust grammatical development than diagnostic teach–retest cycles when learners are provided with adequate scaffolding and meaningful opportunities for rule construction and communicative application.

The combined results also correspond quite well with the Skill Acquisition Theory (DeKeyser, 2020), which postulates that second-language acquisition progresses from declarative to procedural knowledge through meaningful practice and feedback. In the GDL condition, learners were supposed to be involved in pattern recognition, hypothesis formation, and rule verification-activities all of which activate the process of proceduralization via the transformation of explicit knowledge into automatized control.

From the perspective of the Noticing Hypothesis, Schmidt (2010) observed that the guided-discovery worksheets and the teacher's scaffolding raised awareness of form-meaning relationships without overt rule explanation. The process encouraged learners to detect and self-correct gaps-an activity associated with long-term retention and restructuring of interlanguage representations. Though the TTT model was successful in revealing knowledge gaps, during its core Teach phase, it likely provided limited opportunities for self-regulation. To the extent that explicit instruction came to dominate, learners' cognitive engagement probably declined, with resultant shallower processing and smaller posttest gains.

The findings converge strongly with previous research supporting discovery-oriented and inductive approaches to grammar instruction. Consistent with the current results, research on guided discovery has shown that engaging learners in inferential analysis and hypothesis formation promotes deeper cognitive processing, improved retention, and greater transfer of grammatical knowledge (Alfieri et al., 2011; Janssen et al., 2014). Similarly, work on consciousness-raising instruction reveals that inductive engagement with form–meaning relationships facilitates conceptual understanding, stable interlanguage restructuring, and sustained attention to linguistic data (Ellis, 2002).

At the same time, earlier research on explicit and diagnostically driven instruction has demonstrated that approaches such as TTT are effective in raising grammatical awareness and supporting short-term accuracy gains by drawing learners' attention to form–function mismatches (Harmer, 2007; Spada & Tomita, 2010). Meanwhile, the present results are consistent with previous studies that have shown that diagnostically informed and explicitly focused instruction can facilitate short-term improvements in grammatical accuracy, especially when instruction is tailored to learners' difficulties (Harmer, 2007; Spada & Tomita, 2010).

Overall, this body of previous research supports that diagnostic assessment and inferential reasoning are not incompatible, but may complement each other within an integrated form-focused instruction framework. The current study extends existing research by providing direct empirical evidence that, while both approaches are pedagogically valuable, GDL may offer stronger support for sustained grammatical development, whereas TTT may function more effectively as a diagnostic and awareness-raising instructional cycle. By comparing GDL and TTT instruction in a controlled classroom setting with the same instructor and identical instruction materials, this research provides a more internal and controlled design for evaluating the effect of the pedagogical variable.

7 Conclusion and Implications

The current study compared GDL and TTT formats in terms of their effectiveness for grammatical achievement with intermediate Iranian EFL learners. While both models of instruction led to significant improvement in grammar performance, GDL showed higher posttest gains with a large effect size, confirming the pedagogical potency of inductive, learner-centered discovery.

Results from both Skill Acquisition Theory and the Noticing Hypothesis converge to suggest that grammar learning is optimally achieved when learners themselves construct and test linguistic rules through contextualized input and feedback. Such results would support a pedagogical shift away from rule explanation toward guided exploration of form, encouraging teachers to devise tasks likely to promote noticing, hypothesis testing, and self-correction.

While generalization is tempered by intact classes and short-term measurement, overall, the evidence supports effectiveness in using discovery-based instruction to develop grammatical accuracy and autonomy in EFL contexts. Future research incorporating hybrid diagnostic-discovery approaches and technology-enhanced scaffolds holds great promise in further supporting evidence-based grammar pedagogy and fine-tuning how learners internalize the structure of language.

The results of the study verify the effectiveness of guided discovery in facilitating deeper learning. Grammar teaching can be incorporated into task design that supports learners to notice, hypothesize, and verify grammatical patterns before being explicitly stated. For example, the use of discovery worksheets can substitute the traditional rule-first presentation phases (Spada, 2021).

However, the benefits of TTT should also be recognized. A well-designed classroom procedure could thus combine both methods by starting with a diagnostic task, followed by a guided discovery process, and finishing with focused feedback. This hybrid cycle ensures instructional responsiveness and maintains cognitive engagement, and is consistent with form-focused instruction views that highlight the role of awareness, practice, and communication (Spada, 2021).

The results also have implications for teacher preparation. Teachers need to be trained to strike a balance between guidance and autonomy, as overemphasizing explicitness can limit reflection, while unguided discovery may lead to the misgeneralization of grammar knowledge.

Although this research makes significant contributions to the field, several limitations must be acknowledged. First, the study employed a quasi-experimental design using intact classes; therefore, random assignment at the individual level was not feasible, and results should be interpreted at the classroom level. Second, a notable gender imbalance existed between the conditions, as the TTT group consisted of female learners while the GDL group comprised male participants. While gender was not a primary variable, this disparity may have influenced the findings. Third, the sample size was relatively

small and limited to a single private institute. Finally, the absence of a delayed post-test means the results are confined to short-term grammatical development and cannot be generalized to long-term retention.

Regarding the delimitations, the scope of the study was intentionally narrowed in several ways. It specifically targeted intermediate-level Iranian EFL learners to maintain group homogeneity. Furthermore, the investigation was restricted to the tense and article systems, as these are known areas of difficulty for Persian speakers. The pedagogical scope was also delimited to sixteen face-to-face sessions conducted by a single instructor using identical materials to ensure internal consistency. Consequently, the outcomes do not account for technology-mediated learning environments or other proficiency levels.

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Authors' Contributions

All authors have conducted the study, collected data, analyzed and interpreted the data, and written up the manuscript.

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Conflict of Interest

The authors declare that there is no conflict of interest.

References

- Alfieri, L., Brooks, P. J., Aldrich, N. J., & Tenenbaum, H. R. (2011). Does discovery-based instruction enhance learning? *Journal of Educational Psychology*, *103*(1), 1–18. <https://doi.org/10.1037/a0021017>
- DeKeyser, R. M. (2020). Skill acquisition theory. In B. VanPatten, G. D. Keating, & S. Wulff (Eds.), *Theories in second language acquisition: An introduction* (3rd ed., pp. 83–104). Routledge.
- Ellis, R. (2002). Grammar teaching—Practice or consciousness-raising? In J. C. Richards & W. A. Renandya (Eds.), *Methodology in language teaching: An anthology of current practice* (pp. 167–174). Cambridge University Press.
- Ellis, R. (2003). *Task-based language learning and teaching*. Oxford University Press.
- Ellis, R. (2006). *The study of second language acquisition* (2nd ed.). Oxford University Press.
- Ellis, R. (2009). *Implicit and explicit knowledge in second language learning, testing and teaching*. Multilingual Matters.
- Ellis, R. (2019). *Understanding second language acquisition* (2nd ed.). Oxford University Press.
- Harmer, J. (2007). *How to teach English* (New ed.)? Pearson Longman.
- Hutchinson, T., & Edwards, L. (2013). *Project: Intermediate* (3rd ed.). Oxford University Press.
- Ionin, T., Ko, H., & Wexler, K. (2004). Article semantics and specificity in L2 acquisition: The role of transfer. *Language Acquisition*, *12*(1), 3–69. https://doi.org/10.1207/s15327817la1201_2
- Janssen, F. J. J. M., Westbroek, H. B., & van Driel, J. H. (2014). How to make guided discovery learning practical for student teachers. *Instructional Science*, *42*(1), 67–90. <https://doi.org/10.1007/s11251-013-9296-z>
- Krashen, S. D. (1982). *Principles and practice in second language acquisition*. Pergamon Press.
- Larsen-Freeman, D. (2020). Complexity theory: Relational systems in interaction and in interlocutor differences in second language development. In L. Gurzynski-Weiss (Ed.), *Cross-theoretical explorations of interlocutors and their individual differences* (pp. 189–208). John Benjamins Publishing Company.
- Lightbown, P. M., & Spada, N. (2021). *How languages are learned* (5th ed.). Oxford University Press.
- Loewen, S., & Sato, M. (2024). *A practical guide to second language teaching and learning*. Cambridge University Press.
- Lyster, R., & Ranta, L. (1997). Corrective feedback and learner uptake: Negotiation of form in communicative classrooms. *Studies in Second Language Acquisition*, *19*(1), 37–66. <https://doi.org/10.1017/S0272263197001034>
- Nassaji, H., & Kartchava, E. (Eds.). (2020). *The Cambridge handbook of corrective feedback in second language learning and teaching*. Cambridge University Press.

- Norris, J. M., & Ortega, L. (2000). Effectiveness of L2 instruction: A research synthesis and quantitative meta-analysis. *Language Learning*, 50(3), 417–528. <https://doi.org/10.1111/0023-8333.00136>
- Schmidt, R. (2010). Attention, awareness, and individual differences in language learning. In W. M. Chan et al. (Eds.), *Proceedings of CLaSIC 2010* (pp. 721–737). National University of Singapore.
- Shangarffam, N., & Hosseini, M. (2018). Guided discovery learning and grammar development: The case of Iranian EFL learners. *Journal of Teaching Language Skills*, 37(3), 87–112.
- Spada, N. (2021). Form-focused instruction and second language acquisition. In B. VanPatten, G. D. Keating, & S. Wulff (Eds.), *Theories in second language acquisition: An introduction* (3rd ed., pp. 229–248). Routledge.
- Spada, N., & Tomita, Y. (2010). Interactions between type of instruction and type of language feature: A meta-analysis. *Language Learning*, 60(2), 263–308.
- Swain, M. (2005). The output hypothesis: Theory and research. In E. Hinkel (Ed.), *Handbook of research in second language teaching and learning* (pp. 471–483). Lawrence Erlbaum Associates.

APPENDICES

Appendix A - Grammar Pretest & Posttest Questions

- I all their records since then.
A) bought
B) buy
C) will buy
D) have bought
- I'm looking after Tom today. He's been at my house 8.00 this morning.
A) at
B) for
C) since
D) from
- Anna has had a bad cold the last few days.
A) for
B) after
C) since
D) in
- David can go to bed now. He his homework.
A) finish
B) has finished
C) finishes
D) finished
- Alison in Chicago, but she would like to go there one day.
A) was

- B) has been
C) wasn't
D) has never been
6. Peter his work three hours ago.
A) has finished
B) will finish
C) finished
D) finishes
7. You do the washing-up. I've got a washing machine.
A) should
B) have to
C) mustn't
D) don't have to
8. He and his wife have lived next to me their son, Tom, was born.
A) for
B) when
C) since
D) from
9. "I can't sleep."
"You drink coffee at night."
A) must
B) shouldn't
C) don't have to
D) have
10. I've told him several times, but he doesn't understand.
A) yet
B) already
C) no longer
D) still
11. He lives in the house where he was born.
A) already
B) yet
C) still
D) every
12. to a rock concert?
A) Were you ever go
B) Have you ever been
C) Do you ever go
D) Have you ever go
13. I don't think people get married until they're 21.
A) have to
B) would
C) should
D) are

14. I went to the doctor's yesterday. I for half an hour before he could see me.
A) must wait
B) had to wait
C) should wait
D) ought to wait
15. My boss is sending me to Africa on business. But two days.
A) I've had a pain for
B) I've had a pain since
C) I'm having a pain for
D) I'm having a pain since
16. They liked the hotel because they do any cooking.
A) have to
B) had to
C) should
D) didn't have to
17. Joanna Trollope a lot of books. She her first book in 1980.
A) wrote/wrote
B) has written/wrote
C) had written/wrote
D) wrote/had written
18. Sarah's English is getting better. She a lot of English since she here.
A) learned/has come
B) has learned/ has come
C) has learned/came
D) learned/came
19. Mike and Jack here five months ago. They in this city for five months.
A) came/have been
B) have come/have been
C) come/were
D) has come/has been
20. I've known him we went to school together, but I've _____ met his parents.
A) ever / ever
B) for / never
C) since/for
D) since / never
21. Your hair's too long. I think you get it cut.
A) have to
B) should
C) have
D) will

22. Your clothes smell, and you've got a cough. You smoke.
A) don't have to
B) should
C) shouldn't
D) have to
23. I'm going to bed. I be up early tomorrow.
A) should
B) shouldn't
C) don't have to
D) have to
24. I'd like to meet your friend. You invite him round.
A) must
B) have to
C) would
D) don't have to
25. I tell my parents where I am, then they don't worry.
A) should
B) don't have to
C) have to
D) shouldn't
26. You come with me if you don't want to. I'll go on my own.
A) don't have to
B) must
C) should
D) shouldn't
27. Our train leaves in two minutes! We hurry.
A) would
B) have to
C) must
D) don't have to
28. If you need some help with your homework, you go to the library.
A) should
B) mustn't
C) have to
D) shouldn't
29. If you've got a ticket, you queue. You can go straight in.
A) shouldn't
B) don't have to
C) have to
D) should

30. You tell lies. It's wrong.

- A) don't have to
- B) should
- C) have to
- D) shouldn't

31. Geoff works too much. I think he take it easy.

- A) must
- B) have to
- C) should
- D) don't have to

32. My bedroom is a real mess. I clean it.

- A) have to
- B) must
- C) don't have to
- D) should

33. There's a wonderful new restaurant opened in town. You go there.

- A) shouldn't
- B) must
- C) don't have to
- D) should

34. You can borrow my tennis racquet, but you keep it very well. It was very expensive.

- A) don't have to
- B) should
- C) must
- D) have to

35. It's my mother's birthday tomorrow. I buy her a present.

- A) must
- B) have to
- C) shouldn't
- D) don't have to

Appendix B. Sample Guided Discovery Learning (GDL) Worksheet (Intermediate Level)

Target Structure: Present Perfect (*have/has + past participle*)

Lesson Topic: "Life Experiences"

Objective: To help learners notice, infer, and apply the form and meaning of the present perfect in contrast with the simple past.

Step 1 – Contextualized Input:

Read the sentences below and underline the verbs in bold.

- (1) *I **have visited** many cities in Iran.*
- (2) *I **have never eaten** sushi.*
- (3) *Last year, I **went to Kish Island** with my family.*

Step 2 – Guided Noticing

1. Which sentence talks about a specific past time?
2. Which sentences talk about general experiences with no exact time?
3. What word comes before the past participle (like *visited, eaten*)?
4. Which auxiliary verb changes with *he/she/it*?

Example	Time Reference	Meaning	Form
I went to Kish last year.	Finished past	One specific event	Verb + -ed / irregular
I have visited many cities.	No specific time	Experience up to now	have/has + past participle

Step 3 – Rule Formation

Complete the rule:

We use have/has + past participle to talk about or that are connected to the

Step 4 – Verification

Check your ideas:

- ✓ *Affirmative:* I have visited Kish. She has visited Kish.
- ✓ *Negative:* I haven't visited Kish. She hasn't visited Kish.
- ✓ *Question:* Have you visited Kish?

Step 5 – Communicative Practice

Work in pairs. Ask and answer:

1. Have you ever traveled by plane?
2. Have you ever won a competition?
3. Have you ever lost something important?

Share one interesting answer with the class.

Step 6 – Reflection

1. What helped you understand the rule today?
2. What part was difficult?

Implementation Notes:

1. Duration: ≈ 45 minutes
2. Mode: Pair / whole-class
3. Teacher: Facilitator, confirms or refines hypotheses
4. Level: Intermediate EFL learners
5. Focus: Accuracy + meaningful use

Appendix C. Sample Test–Teach–Test (TTT) Lesson Cycle (Intermediate Level)

Target Structure: English Articles (*a, an, the, Ø*)

Lesson Topic: “Objects Around Me”

Objective: To identify learners’ current article use, provide focused clarification, and measure immediate improvement.

Phase 1 – Initial Test (Diagnosis)

Task: Describe three things on your desk.

Example prompt:

I see ____ pen and ____ notebook on ____ desk.

Learners speak or write freely.

Teacher notes missing or incorrect articles.

Phase 2 – Teach (Input + Clarification)

Teacher summarizes frequent errors on the board:

I saw cat on table → I saw a cat on the table.

Article	Use	Example
a / an	first mention, non-specific	I bought a book.
the	second mention, shared knowledge	The book is on the desk.
Ø	plurals / uncountables	I like music and books.

Controlled Practice:

Fill in *a, an, the, or Ø*.

1. I have apple for breakfast.
2. Please open window.
3. I like listening to music.

(Answers: *an, the, Ø*)

Phase 3 – Final Test (Re-application)

Learners describe their living room:

There is a sofa next to the window and Ø flowers on the table.

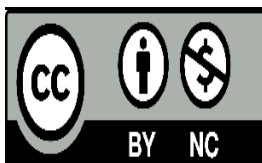
Teacher checks article accuracy (% correct use).

Phase 4 – Feedback and Reflection

Teacher gives group feedback and highlights common progress.

Learners answer:

1. Which article rules do you understand better now?
2. Which still confuse you?



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