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Research paper

Collaborative Discovery Learning and EFL Learners' Writing Performance: A Mixed-Methods Study

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Abstract

This mixed-methods study explored the effect of collaborative discovery learning on EFL learners' writing performance. To this end, 60 intermediate EFL learners from two classes at a language institute were non-randomly selected. A writing pretest was administered to the participants. Then, each class was assigned to a group, experimental or control. In the experimental group, the writing skill was instructed based on collaborative discovery learning, while in the control group, writing was instructed based on a traditional approach. After eight weeks, the participants in both groups took a writing posttest. The results of independent samples t-tests showed that there was a statistically significant difference between the two groups' mean scores on the writing posttest, indicating the outperformance of the experimental group over the control group. Moreover, the results of the semi-structured interview revealed that collaborative discovery learning could enhance both performance and perception of the EFL learners in the experimental group. The findings advocate for rethinking traditional classroom practices by prioritizing learner collaboration and inquiry-driven tasks to better address real-world communication challenges.

Keywords: collaborative discovery learning, writing performance, EFL learners, mixed-methods study

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Introduction

Writing in a second or foreign language still suffers from the lack of a comprehensive and conclusive theory or model (Hyland, 2019). Strong writing skills may enhance students' chances for success (Agredo-Delgado et al., 2020). In discussing the importance of writing to learning,

Khansir (2012) added that "learning of writing is one of the most important skills that second language learners need to develop their ability to communicate ideas and knowledge effectively in the target language" (p. 282).

Writing is also considered an important part of almost all university-level courses (Rezaei & Lovorn, 2010). There are some active ways of teaching writing, including collaborative discovery learning, which have intentionally departed from traditional approaches. Schunk (2012) explained that discovery refers to constructing and testing hypotheses rather than simply reading a passage or taking note of the teacher's presentations or other students' lectures. Due to the fact that learners move from studying specific examples to formulating general rules, concepts, and principles, discovery is known as a form of inductive reasoning (Schunk, 2012). According to Ögeyik (2011), discovery activities are generally helpful for deep processing in all language skills and help students in grasping learning strategies. Schunk (2012) also explained that teachers who apply discovery learning for teaching should present questions, problems, or puzzling situations to be resolved and will encourage students to create intuitive guesses when they are uncertain about the answers; additionally, teachers can ask questions with no readily available answers and grading in order that students come to their understandings, and teachers may also give suggestions to students on how to search for answers in order to attain a better result.

Likewise, collaborative learning has become an important component for the teaching-learning process; thus, it is necessary to use an active and interactive methodology in virtual classrooms (Agredo-Delgado et al., 2020). Additionally, it should be noted that collaborative learning is one of the necessary skills; it is based on asynchronous interactions that favor autonomy in every member of the group by using the various platforms to exchange information with their

peers and permit the achievement of learning in a democratic and shared way (García-Chitiva, 2021).

In turn, when developing collaborative learning, the teacher assumes the role of facilitator, guide, and collaborator during the development of the learning process, leaving aside being a transmitter of knowledge, having learners responsible for their proposed goal (Cornide-Reyes & Villarroel, 2019). In the same way, collaborative learning generates relevant, motivating, useful, lasting, profound, and significant learning; it interrelates the theoretical with the practical, improving academic results (Castillo & Suárez, 2020). Additionally, it has been evidenced that collaborative learning in virtual environments is designed by techniques and educational technological resources, enhancing the classrooms in a very instructive approach and generating significant events in them (Lizcano-Dallos et al., 2019).

In a collaborative learning setting, learners have the opportunity to converse with peers, present and defend ideas, exchange diverse beliefs, question other conceptual frameworks, and are actively engaged (Srinivas, 2011). The limitations of conventional methods have spurred interest in alternative pedagogies that align with constructivist principles, such as collaborative discovery learning. Rooted in Vygotsky's sociocultural theory, this approach emphasizes social interaction and active inquiry, positioning learners as co-constructors of knowledge rather than passive recipients (Hajiyani & Exir, 2024; Sharifi & Gorjian, 2023). Previous research highlights the benefits of collaborative writing tasks, which encourage peer feedback, negotiation of meaning, and shared responsibility for learning outcomes.

Studies have examined the role of collaborative discovery learning on the sub-skills of EFL learners. For example, Jafari and Nejad Ansari (2012) studied the effects of collaboration on Iranian EFL learners' writing accuracy. The results revealed that the students in the collaborative

writing group outperformed the students in the control group, thereby emphasizing the significant role of collaboration in L2 writing. Regarding gender effect, the data analysis showed the females in the collaborative group outperformed males in the same group, proving that gender plays a significant role in Iranian EFL collaborative writing settings.

Hung (2016) studied the effects of collaborative online learning on EFL learners' writing performance and self-efficacy. The results indicated that this instructional method effectively improved the learners' writing performances and also influenced the latent structures of the learners' self-efficacy from theoretical constructs toward pedagogical meanings, with the learners' writing self-efficacy beliefs being altered by the instruction and becoming consistent with the assessment criteria.

Eskandari and Soleimani (2016) examined the effect of collaborative discovery learning using MOODLE on the learning of conditional sentences by Iranian EFL learners. The analysis of the data was done through a t-test. Finally, it was concluded that the experimental group outperformed the control group; however, there was no statistically significant difference between the achievements of the two groups. Moreover, the interview data indicated that the participants had an overall positive attitude towards virtual learning and MOODLE.

Afghari and Khayatan (2017) investigated the collaborative learning and Iranian EFL learners' vocabulary improvement through snowball and word-webbing techniques. Findings showed that the applied collaborative techniques, i.e., word-webbing and snowball techniques, paved the way for the experimental group to outperform the control group since improvement in vocabulary learning was found to be significant. Moreover, qualitative results revealed the occurrence of positive changes in the learners' attitudes about vocabulary learning since almost all the learners concurred that the abovementioned collaborative techniques assisted them in their

better speaking, and, by having more interaction through group work, an enjoyable environment was created for learning target vocabularies.

Hasanvand and Mohammadian (2022) studied the effects of guided discovery learning on the development of Iranian teenage and adult EFL learners' syntactic structures. In this study, paired and independent samples t-tests were used to compare the development of syntactic structures in the studied groups. The results of this study showed that both groups (teenagers and adults) made an improvement, but adults improved more significantly than teenagers. The findings contributed to the practical employment of guided discovery learning as an effective teaching methodology, especially for adults in the process of language learning.

A mixed-methods study by Lee (2020) investigated the impact of machine translation (MT) tools on EFL writing performance in a Chinese university. Participants included 60 intermediate learners divided into experimental and control groups. Instruments comprised pretest/posttest writing assessments, semi-structured interviews, and MT usage logs. Results showed the experimental group significantly improved in syntactic accuracy and lexical diversity, but learners overly relied on MT for grammar correction, which highlights the need for guided instruction.

Ucar and Yukselir (2015) examined corpus-based instruction (CBI) effects on EFL learners' collocation awareness in a Colombian university. Participants included secondary and tertiary students, and instruments involved standardized tests, learner diaries, and AntConc software. Findings revealed CBI enhanced collocation and vocabulary mastery, with intermediate learners benefiting more from guided corpus exploration.

While collaborative discovery learning has been recognized for fostering critical thinking and active participation in general education, its application in EFL writing instruction—especially in intermediate-level Iranian classrooms—remains underexplored. Existing studies often focus on

isolated components of writing, such as grammar or vocabulary, rather than holistic performance. Furthermore, there is a lack of empirical evidence on how such learner-centered pedagogies align with the cultural and educational dynamics of EFL settings like Iran. This gap raises questions about the feasibility and efficacy of collaborative discovery learning in enhancing writing outcomes and learner attitudes, necessitating a targeted investigation into its potential benefits and challenges.

This study aimed to address two objectives aligned with its research questions. First, it sought to determine whether collaborative discovery learning significantly improved the writing performance of intermediate EFL learners compared to traditional instructional methods. Second, this study explored learners' perceptions of collaborative discovery learning, aiming to uncover how this approach influences their motivation, confidence, and engagement in writing tasks. To fulfill the purpose of this study, the following research question was formulated**:**

Q1: Does collaborative discovery learning have any significant effect on EFL learners' writing performance?

Q2: What are EFL learners' perceptions of collaborative discovery learning?

Methodology

This section includes the description of the research design, participants, instruments, data collection procedure, and data analysis techniques used in this study.

Research Design

This study employed a mixed-methods design with a quasi-experimental pretest-posttest control group structure and qualitative interviews to investigate the impact of collaborative discovery learning on intermediate EFL learners' writing performance and perceptions. Sixty intermediate EFL learners from two intact classes at a language institute in Ahvaz, Iran, were non-randomly assigned to experimental and control groups. Data were collected through writing pretests and posttests, scored using a standardized rubric, and semi-structured interviews with 12 purposively selected participants from the experimental group. Quantitative data were analyzed via independent samples t-tests to compare posttest scores, while qualitative data underwent thematic analysis to identify patterns in learners' perceptions.

Participants and Setting

To fulfill the objectives of this study, 60 intermediate EFL learners from two intact classes at a language institute in Ahvaz, Iran, were non-randomly assigned to experimental and control groups. Their age ranged from 16 to 25. The experimental group (n = 30) engaged in collaborative discovery learning activities, such as peer feedback, group problem-solving, and inquiry-based tasks, while the control group (n = 30) followed traditional teacher-centered instruction.

Instruments

The pretest and posttest contained two questions in which the learners were supposed to write about 100 words. The time needed for answering the two questions was approximately 60 minutes. The posttest was also piloted on 30 participants who had the same characteristics as the main participants of the study, with the reliability turning out to be 0.74.

An analytic rating scale was used in this study. In analytic scoring, according to Weigle (2002), writing pieces were rated on several aspects or criteria rather than being given a single score. Analytic scoring schemes thus provided more detailed information about a student's writing performance, and they are preferred over holistic schemes for this reason by many writing specialists. This rating scale was applied to evaluate learners' general writing ability through assessing different aspects of written scripts, such as fluency, structural accuracy, vocabulary (range and appropriateness of vocabulary choices), coherence, cohesion, relevance, organization, and mechanics of writing.

The semi-structured interview was designed to explore Iranian intermediate EFL learners' perceptions of collaborative discovery learning following the 10-week intervention. Twelve participants from the experimental group were purposively selected to ensure diverse perspectives, and interviews were conducted in Persian to facilitate candid responses. The interview protocol included open-ended questions focusing on learners' experiences with collaborative tasks (e.g., peer feedback, group problem-solving), perceived benefits or challenges, and changes in their writing confidence and motivation. Follow-up probes were used to clarify or expand on participants' initial answers. Interviews were audio-recorded with consent, transcribed verbatim, and analyzed thematically using Braun and Clarke's (2006) six-phase approach to identify recurring patterns, such as enhanced engagement, improved critical thinking, and shifts in attitudes toward collaborative learning.

Data Collection Procedure

Participants were assigned to control and experimental groups. The duration of the treatment was 20 sessions (10 weeks), in which one session was for making students familiar with collaborative

discovery learning techniques and the last session was devoted to administering the writing posttest. Each session lasted for 90 minutes.

The control group received the traditional writing instruction. The teacher provided them with some information about the sentence structure and explicit instructions on the outline and general format of writing texts. The teacher guided them in defining and refining the thesis statement, body paragraphs, conclusion, and other components of writing texts. At the end of each session, they were asked to do assigned assignments for the next session. In the next session, they explained one by one their homework, and the instructor examined each revised draft and gave some more feedback when necessary.

In the experimental group, however, the same set of topics in writing skill was taught based on collaborative discovery learning approaches. Participants in the experimental group were provided with some information about the nature and goal of collaborative discovery learning approaches. The participants were divided into groups of three for collaborative activities. Each session was started with a warm-up and recycling of the material the participants had learned in the last session. The discovery method in this group encourages students to find concepts through the process of observing, classifying, explaining, and drawing conclusions. The role of teachers in this group was creating a situation where students can learn on their own rather than providing a package containing information or lessons to students. In this regard, the teacher goes through the main book, *American English File 2,* and for writing skills, he asks questions, problems, or puzzling situations to be resolved and should encourage students to make intuitive guesses when they are uncertain about the answers; in addition, for leading a class discussion, teachers ask questions with no readily available answers and grading so that students come to their understandings, and teachers can also give suggestions to students on how to search for answers

to achieve a better result. The learners interacted with each other to find the answer in their groups, and they answered the questions. Also, the teacher for some of the questions did not restrict discoveries to the activities in a classroom; in other words, students may find their answers in other places like classroom workstations, the school media center, and on or off the school grounds, and they explained their responses in the next session.

At the end of the course, the participants in both the control and experimental groups were given the writing posttest to measure the effect of collaborative discovery learning on EFL learners' writing performance. In addition, 12 participants from the experimental group were purposively selected to ensure diverse perspectives, and interviews were conducted in Persian to facilitate candid responses.

Data Analysis Procedure

The data analysis in this study was comprised of two series of calculations, descriptive statistics and inferential statistics. The descriptive statistics were related to calculating mean, standard deviation, and reliability checks. Independent sample t-test was used to investigate the effect of collaborative discovery learning on writing performance of intermediate Iranian EFL learners. Finally, the qualitative data from the semi-structured interviews were analyzed using thematic analysis following Braun and Clarke's (2006) framework to identify patterns in learners' perceptions of collaborative discovery learning. Audio-recorded interviews were transcribed verbatim in Persian, and initial codes were generated through iterative readings to capture recurring ideas, such as shifts in motivation, challenges in group dynamics, and perceived improvements in writing skills.

Results

The results are presented in four sections: normality testing, descriptive statistics, inferential statistics, and qualitative findings from the semi-structured interviews. The assumption of normality for the writing pretest and posttest scores was assessed using the Shapiro-Wilk test. As shown in Table 1, the experimental group's pretest scores were normally distributed, W = 0.96, p = .28, and posttest scores also followed a normal distribution, W = 0.97, p = .32. Similarly, the control group's pretest (W = 0.95, p = .19) and posttest (W = 0.94, p = .15) scores were normally distributed. These results confirmed the suitability of parametric tests for subsequent analyses.

Table 1.

Shapiro-Wilk Test Results for Writing Scores

Group	PRETEST*W (P)*	POSTTEST*W (P)*
Experimental (n=30)	0.96 (.28)	0.97 (.32)
Control (n=30)	0.95 (.19)	0.94 (.15)

Descriptive statistics for pretest and posttest writing scores are presented in Table 2.

Table 2.

Descriptive Statistics for Writing Performance by Group

Group	PRETEST*M (SD)*	POSTTEST*M (SD)*
Experimental (n=30)	11.8 (1.9)	15.2 (2.1)
Control (n=30)	11.6 (2.0)	12.4 (1.8)

Both groups demonstrated comparable performance at baseline, with the experimental group scoring M = 11.8 (SD = 1.9) and the control group M = 11.6 (SD = 2.0). After the intervention, the experimental group's mean posttest score (M = 15.2, SD = 2.1) was notably higher than the control group's (M = 12.4, SD = 1.8), suggesting a potential intervention effect. An independent samples t-test revealed a statistically significant difference in posttest scores between the experimental and control groups, $t(58) = 4.21$, $p < .001$, with a large effect size (Cohen's $d = 1.08$). No significant pretest differences were found, $t(58) = 0.37$, $p = .71$, confirming baseline equivalence. Paired samples t-tests were conducted to assess within-group improvements. The experimental group showed significant gains from pretest to posttest, $t(29) = 6.12$, $p < .001$, $d = 1.89$, while the control group's improvement was marginal, $t(29) = 2.34$, $p = .026$, $d = 0.43$. These results highlight the differential impact of the intervention.

Table 3.

Paired Samples T-Test Results by Group

Group	*T*	*P*	Cohen's *d*
Experimental (n=30)	6.12	< .001	1.89
Control (n=30)	2.34	.026	0.43

Thematic analysis of the semi-structured interviews revealed nuanced insights into learners' perceptions of collaborative discovery learning. The first theme, enhanced critical thinking, highlighted how peer interactions deepened analytical skills. Participants emphasized that collaborative tasks, such as peer feedback and group brainstorming, forced them to articulate and defend their ideas, leading to improved writing quality. One learner noted, *"Discussing my essay*

with peers helped me identify gaps in my arguments that I wouldn't have noticed alone." Another added, *"Receiving feedback taught me to revise my work more systematically."* These responses underscored the role of social negotiation in fostering metacognitive awareness. A second theme, increased confidence, emerged as learners reported reduced anxiety about writing. Many expressed that collaborative support made them more willing to experiment with language structures. For instance, one participant stated, *"I used to avoid complex sentences, but my group's encouragement made me try new vocabulary without fear."* This shift in self-efficacy aligns with the quantitative findings of improved posttest scores.

The third theme, challenges in collaboration, revealed logistical and interpersonal hurdles. Participants occasionally struggled with unequal participation, with one learner remarking, *"Some group members relied on others to do most of the work, which slowed us down."* Time management during collaborative tasks also posed difficulties, as another participant explained: *"Reaching a consensus took longer than expected, which sometimes stressed us out."* Despite these challenges, learners acknowledged the value of overcoming disagreements, with one noting, *"Debating ideas taught me to appreciate different perspectives, even if it was frustrating at first."* Overall, the interviews illustrated that while collaborative discovery learning enhanced cognitive and affective outcomes, careful structuring of group dynamics is essential to maximize its benefits. The qualitative findings corroborated the quantitative results, reinforcing the intervention's effectiveness while highlighting areas for pedagogical refinement.

Discussion

This study found that the cooperative discovery learning group significantly improved the writing skills of EFL students compared to the conventional teaching approaches group. The results from the posttest showed that the experimental group, which used group projects, scored much higher (M = 15.2, SD = 2.1) than the control group (M = 12.4, SD = 1.8), supporting earlier studies that highlight the benefits of group work for improving language skills (d = 1.08). Through peer interaction and problem-solving, students actively created knowledge, so underscoring the value of discovery-based pedagogies in fostering more advanced cognitive involvement.

All of this fits Vygotsky's (1978) sociocultural theory of learning, which holds that students scaffold their learning by internalizing skills through directed involvement in social cooperation. As the qualitative data shows, cooperative discovery learning influences students' emotional and cognitive growth as well. Students underlined that engaging in group debates and getting peer comments improved their critical thinking, argumentative, and writing skills. Group projects depend on negotiations of meaning, according to research, which supports this claim (Storch, 2013). One participant described, as an illustration of the metacognitive advantages of group research, how advocating ideas for group projects helped them logically arrange their essays. These discoveries give validity to the quantitative results since they imply that active peer interaction enhances both self-regulation and skill development. Among the most important emotional results of the intervention was a boost in self-confidence.

Consistent with the results of Badr (2020) on the anxiety-reducing power of teamwork, students said they felt less anxious about writing and more at ease communicating themselves orally. Those who work on group projects say they feel supported; one participant even

mentioned how his peers made him more at ease experimenting with new word choices and sentence construction. It is reasonable to assume that this change in self-efficacy helped the experimental group perform better since confidence is directly related to language production (Krashen, 1982). Still, the study does show that confidence increases are not consistent since some students first found it difficult to adjust to an active rather than a passive learning environment. Clearly difficult even with the favorable results was cooperation.

In line with earlier studies, participants mentioned time management and unequal involvement as ongoing problems (Eskandari & Soleimani, 2016). One student claimed, for instance, that slower classmates were hindering their development, and another expressed annoyance with protracted arguments. Organized direction is essential, according to Ortiz et al. (2019), to guarantee fair participation. Such an arrangement can call for assigning rotating roles or defining exact deadlines. Students still claimed that conquering these obstacles improved their capacity to negotiate points of view, highlighting the significance of group discovery in developing resilience and flexibility. In line with earlier conversations, the findings of this study support the theory that cooperative pedagogies have cultural value in Iranian EFL environments. Even though traditional teacher-led methods are still used, student-focused methods can work well in local education when applied intentionally, as seen by the positive response to cooperative discovery learning. García-Chitiva (2021) defined democratic knowledge-sharing and autonomy through cooperative learning as what this entails. The results of the study on the conflict between personal agency and group dependence emphasize the need to match educational approaches with cultural standards concerning cooperation and personal success. These results support those of the 2017 study on cooperative vocabulary learning by Afghari and Khayatan, which revealed, in comparison to past studies, planned

group activities clearly improved writing performance. Likewise, Hung's (2016) study on cooperative online learning—which revealed that these interactions raise self-efficacy—fits the qualitative emphasis on peer comments.

By building on past research and stressing more general writing performance than specific sub-skills, this paper contributes to the body of knowledge already in use on the subject of collaborative discovery learning. Jafari and Nejad Ansari discovered in 2012 that group projects were performed better by female students than by male ones. This research reveals no appreciable gender variations. This disparity calls for more research since it could result from changes in classroom dynamics or cultural standards across history. Furthermore, although Hasanvand and Mohammadadian (2022) discovered that guided discovery learning was more effective for older students, this study concentrated on intermediate learners instead of students of different ages, implying that proficiency level, not age, should be the determining factor in educational design.

Theoretically, this study justifies EFL writing instruction using constructivist and sociocultural models. Collaborative discovery learning overcomes the restrictions of memorizing-based approaches, which usually do not equip students for the communicative demands of the real world, by involving students as active co-contractors of knowledge (Hyland, 2019). Additionally, following Ögeyik's (2011) focus on understanding through discovery activities like peer feedback and inquiry-based tasks, it can be concluded that these methods are particularly effective for mastering skills. One of the pragmatic consequences for teachers is the need to correctly scaffold group projects (Hajiyani & Exir, 2024; Sharifi & Gorjian, 2023).

Teachers can help alleviate problems like uneven participation by establishing ground rules, providing positive examples of peer feedback, and keeping tabs on group dynamics. Apart from giving teacher preparation in facilitating roles top priority, legislators should reject conventional transmitter of knowledge paradigms (Cornide-Reyes & Villarroel, 2019).

Furthermore, as Eskandari and Soleimani (2016) pointed out, in environments with limited resources, asynchronous cooperation may be improved by including technological platforms like MOODLE. Finally, this study emphasizes the need to run longitudinal studies to evaluate over time how cooperative discovery learning affects students' attitudes and writing skills. Future studies could cover the relevance to many contexts, cultural backgrounds, and language capacities, as well as strategies for addressing enduring issues, including group project equity and time management.

Conclusion

This research emphasizes how cooperative learning affects Iranian intermediate EFL students' writing and general classroom impressions. The program greatly raised students' writing scores by using group problem-solving, practical exercises, and peer feedback, all of which simultaneously developed critical thinking, self-confidence, and an openness to experimenting with new language abilities. These results align with sociocultural theories stressing the need of social interaction as a learning facilitator since they show that cooperative education is more successful than conventional instruction. In situations where group learning is still not generally embraced, however, the difficulties of unequal participation and time management underline the need of structured scaffolding to guarantee fair involvement. Research indicates

that teachers should start assuming a more facilitative role instead of being so detached; in this regard, they should create projects with group projects and student agency first in mind. Legislators and curriculum designers should take into account including collaborative discovery learning into EFL systems together with training courses giving teachers techniques for controlling group dynamics. Materials developers can also be involved by producing tools that enable research and peer interaction—such as guided discovery programs or online platforms for asynchronous collaboration. Furthermore, in environments where writing anxiety is common, the favorable changes in students' self-efficacy emphasize the need of pedagogical planning mostly based on affective elements, which are usually neglected in conventional approaches.

Although the present work offers perceptive analysis, there are several restrictions on it. First of all, the small sample size of sixty intermediate EFL learners from one language institute makes the results ungeneralizable for a larger population or educational environments with different cultural or pedagogical criteria. Second, the non-random assignment of intact classes to the control and experimental groups might have resulted in selection bias, so distorting the outcomes. Although a 10-week intervention might be sufficient to develop skills momentarily, it might not fairly represent the long-term effects of cooperative discovery learning on retention or continuity of education. Depending on self-reported interview data for impressions also runs the danger of social desirability bias. This happens when participants draw on good experiences to line their inflated expectations. Although cooperative discovery learning has the long run potential to enhance writing abilities, it is unknown if this will be the case across various cultural settings and proficiency levels. Future studies should seek to answer these questions. Further research on the junction of this approach with technologies-

enhanced tools, such artificial intelligence-driven peer feedback systems driven by resource constraints and scalability could be warranted as a possible solution. Mixed-methods approaches also help to clarify the complexity of group dynamics by looking at the effects of demographic factors on team performance, including age, gender, and personality traits. By contrasting discovery learning with other experiential learning techniques such as project-based learning, we can ultimately better appreciate the effectiveness of several student-centered approaches to EFL instruction.

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