

The Integration of Individual and Cooperative Data-Driven Learning (DDL) as a Learning Innovation to Promote Collocational Acquisition

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Abstract—Collocational competence is a crucial component of English as a Foreign Language (EFL) learners' linguistic knowledge, contributing to fluency, accuracy, and naturalness in communication. Despite its importance, Thai EFL learners frequently experience difficulties in acquiring English collocations, and effective instructional approaches to address this issue remain underexplored. To bridge this gap, the present study investigates the integration of individual and cooperative Data-Driven Learning (DDL) as an innovative approach to teaching English adjective-noun collocations in EFL classrooms. A quasi-experimental study employing a One-Group Pretest-Posttest Design was conducted with 50 Thai EFL learners over a 12-week period, during which target adjective-noun collocations were studied through a combination of individual and cooperative DDL activities. The findings revealed that the integrated DDL approach significantly enhanced learners' collocational knowledge, particularly in recognizing and categorizing collocational patterns. However, its impact on productive use was comparatively limited, indicating the need for more targeted practice to facilitate the transfer of receptive knowledge into active production. In addition, Thai EFL learners revealed positive attitudes toward the integrated DDL activities, particularly valuing their interactive and engaging features. Overall, the study underscores the pedagogical potential of integrating individual and cooperative DDL as an effective instructional innovation that promotes collocational competence while fostering an active learner-centered and inclusive learning environment for Thai EFL learners who may be disadvantaged by traditional teacher-centered instruction.

Index Terms—Data-Driven Learning (DDL), collocational acquisition, cooperative learning, autonomous learning, quality education

I. INTRODUCTION

English collocations have played a significant role in English as a Foreign Language (EFL) teaching and learning because mastery of collocations, such as adjective-noun combinations (e.g., '*strong evidence*', '*heavy rain*'), enhances learners' fluency and accuracy, enabling them to communicate more naturally and meaningfully (Lewis, 2000). Many scholars (e.g., Hedge, 2000; Hoey, 2005; Nation, 2008; Wray, 2009) have also highlighted that native speakers store and retrieve language in prefabricated chunks rather than isolated words. This makes collocational knowledge vital for EFL learners, as it enables them to express ideas accurately and fluently.

Despite their importance, collocations remain a challenging aspect for language learners, particularly Thai EFL learners, who often struggle to understand and produce them correctly. Many studies (e.g., Boonraksa & Naisena, 2021; Boonyasquan, 2006; Mallikamas & Pongpairoj, 2005; Phoocharoensil, 2011; Yumanee & Phoocharoensil, 2013) have further confirmed that many Thai EFL learners, regardless of their English proficiency level, have encountered many difficulties in learning and producing English collocations. For Thai learners, these difficulties are compounded by negative transfer from Thai to English, which often leads to inappropriate use of English collocations, such as '*strong rain*' instead of the correct '*heavy rain*'. Accordingly, collocation instruction should be emphasized in classroom practice to enable learners to overcome these challenges effectively. Although some studies on collocations have been conducted in Thai contexts, most of these studies aim to analyze collocational errors produced by Thai EFL learners (e.g., Boonraksa & Naisena, 2021; Boonyasquan, 2006; Mallikamas & Pongpairoj, 2005; Phoocharoensil, 2011; Yumanee & Phoocharoensil, 2013). Consequently, a research study investigating an effective method for teaching collocations, particularly adjective-noun collocations, to Thai EFL learners is relatively understudied. The lack of evidence from a research study leaves educators without comprehensive guidance on how to address these challenges in classrooms.

To shed light on this perspective, the present study explores the integration of individual and cooperative Data-driven Learning (DDL) as an innovative approach to teaching English collocation. DDL, introduced by Johns (1991), involves the use of extensive English corpora in language teaching and learning (Jones & Waller, 2015; Timmis, 2015).

Implementing DDL in language classrooms offers several advantages, as it is reported to help learners become more effective language users (Johns, 1991). Individual DDL tasks facilitate independent exploration of language patterns, whereas cooperative DDL activities foster collaboration and peer learning. Both approaches have demonstrated potential to increase learners' awareness of linguistic structures, promote learner autonomy, and support long-term retention (Boulton, 2010).

Despite its potential, DDL has not become a mainstream practice in language learning and teaching, partly due to perceived implementation challenges (Chambers, 2005; Farr, 2018). Given the ongoing debate regarding the advantages and disadvantages of DDL, further research is needed to clarify its effectiveness. Although the effectiveness of DDL has been examined in certain contexts, no previous studies have explored the combined use of individual and cooperative DDL activities as a pedagogical approach for teaching collocations, specifically adjective-noun combinations, to Thai EFL learners. This study addresses these gaps by investigating the integration of individual and cooperative DDL activities for teaching adjective-noun collocations to Thai EFL learners. The findings aim to enhance understanding of DDL's pedagogical potential in developing collocational competence and fostering positive learner attitudes, while contributing to the creation of a more learner-centered and inclusive environment for effective English collocation learning.

II. LITERATURE REVIEW

A. The Importance and Challenge in Collocation Acquisition for EFL Learners

Collocations, defined as “the property of language whereby two or more words seem to appear frequently in each other's company” (Hoey, 2005, p. 2), play a crucial role in achieving both fluency and accuracy in language use. These habitual combinations—such as *'make a decision'* or *'strong coffee'*—are fundamental to native-like proficiency because they reflect patterns that are predictable to native speakers but often unfamiliar to EFL learners.

In the context of EFL learning, knowledge of collocations significantly enhances overall language proficiency, particularly in terms of fluency, accuracy, and naturalness in both spoken and written communication. Wray (2009) notes that when learners store and retrieve frequent word combinations as chunks, rather than assembling sentences word by word, their speech becomes more fluent, and processing demands are reduced. This pattern of usage also corresponds with native-speaker processing, contributing to more efficient and natural language production.

In addition to fluency, accuracy is similarly enhanced by collocational knowledge. The knowledge of collocations prevents learners from producing errors in expressions such as *'do a mistake'* instead of *'make a mistake'*, or *'big rain'* instead of *'heavy rain'*. Hedge (2000) and Hoey (2005) emphasize that mastering collocations allows learners to construct more natural-sounding sentences, thereby reducing awkward or non-idiomatic expressions. For instance, *'strong tea'* is more naturally acceptable in native usage than *'powerful tea'*, even though both adjectives can be synonymous in other contexts.

Despite their significant role in enhancing language proficiency, collocations present considerable challenges for EFL learners. Unlike single vocabulary items, collocations are not always easily deducible from the meanings of individual words, which can make their acquisition particularly difficult. The non-transparent nature of many collocations means that learners cannot always rely on direct translation or word-for-word understanding, which is a primary strategy for acquiring individual vocabulary (Schmitt, 2000). For example, the phrase *'pay attention'* does not follow a literal or intuitive meaning of *'pay'* and *'attention.'* The verb *'pay'* is commonly associated with financial transactions, but in this case, it takes on a figurative meaning when paired with *'attention'*, making the phrase less transparent. Consequently, EFL learners who lack familiarity with such figurative uses often struggle to grasp the meaning, which can lead to misuse in both comprehension and production. This semantic opacity makes direct translation and word-for-word learning strategies—commonly used for vocabulary acquisition—less effective for collocations (Schmitt, 2000).

A further challenge involves negative transfer from the learner's first language (L1). EFL learners frequently apply collocational patterns from their native language to English, resulting in non-standard or unidiomatic expressions (Boonraksa & Naisena, 2021; Yumanee & Phoocharoensil, 2013). This phenomenon, described as negative transfer or language interference, is particularly evident among learners from non-English-speaking backgrounds. For instance, Thai EFL learners may produce phrases such as *'play a mistake'* instead of *'make a mistake'*, or *'big happiness'* instead of *'great happiness'*, reflecting L1-influenced lexical choices. This transfer of L1 collocational patterns occurs because learners tend to overgeneralize the rules they have learned in their first language and apply them inappropriately to English.

Limited access to authentic language input further exacerbates these challenges. EFL learners in non-English-speaking environments often lack regular exposure to natural, context-rich language, restricting their opportunities to encounter collocations in meaningful contexts. In the absence of immersive input, learners frequently rely on explicit instruction or artificial examples that may not adequately reflect real-world usage (Saito & Liu, 2021).

In summary, several interrelated factors, including lack of transparency, L1 interference, and limited exposure to authentic language, contribute to the difficulty of acquiring collocations in EFL settings. Although these challenges are

substantial, research indicates that instructional interventions emphasizing authentic input, contextualized learning, and corpus-based resources can support more effective acquisition and use of collocations.

B. Principles and Advantages of Data-Driven Learning (DDL) for Collocation Acquisition

The concept of DDL was first introduced by Johns (1991), who defined it as “the use of classroom computer-generated concordances to get learners to explore regularities of patterning in the Target Language (TL), and the development of activities and exercises based on concordance output” (Johns, 1991, p. 4). In this approach, learners interact directly with authentic linguistic data retrieved from corpora—large computerized databases of real-life language use—to discover lexical and grammatical patterns. Building on Johns’s framework, Sripicharn (2002) describes DDL as a process of analyzing vast databases of English texts through specialized software to identify recurring language features. The approach, also referred to as “classroom concordancing,” encourages learners to explore corpus-generated concordance lines to uncover the regularities of lexical patterns, transforming the language classroom into a site of linguistic investigation.

Johns (1991) proposed three fundamental steps in the classical DDL framework: *Identification*, *Classification*, and *Generalization*. The *Identification* step involves recognizing the target language item or structure to be examined, which can be initiated by teachers or learners. The *Classification* step requires learners to examine concordance lines—either paper-based or digital—from corpora such as the BNC or COCA, and group similar examples to observe recurring linguistic patterns. The final step, *Generalization*, is the most critical stage, as learners synthesize their observations and infer language rules based on evidence drawn from authentic corpus data. Through this inductive process, learners act as linguistic researchers, forming hypotheses and testing them against real language use. Based on these learning processes, DDL situates learners as active participants and central agents in knowledge construction rather than passive recipients of language rules.

Recognizing learners as central agents in the learning process, DDL has been widely regarded as an effective pedagogical approach, particularly for collocation acquisition. Sripicharn (2002) characterizes DDL learners as “active researchers” who interpret corpus evidence to develop linguistic understanding autonomously. This learner-centered approach fosters independence and critical thinking—both of which are essential in mastering collocational competence. Scholars such as Kulsithiboon and Pongpairoj (2018), Sripicharn (2002), and Yaemtui and Phoocharoensil (2019) emphasize that DDL promotes learner autonomy by allowing students to independently explore authentic corpus data and discover how collocations are used in diverse contexts. This autonomy is especially valuable in EFL environments, where exposure to native speakers or authentic input is limited (Saito & Liu, 2021). By repeatedly engaging with real examples of collocations, learners develop not only contextual understanding but also long-term retention and more accurate usage (Boulton, 2010).

Moreover, DDL encourages deep cognitive engagement as learners actively analyze and compare collocational patterns rather than memorizing fixed phrases. For instance, when studying the collocation ‘heavy rain’, learners may also observe how ‘heavy’ collocates with ‘traffic’ or ‘workload’, thereby gaining insight into its broader semantic range (Chambers, 2005). This analytical process enhances lexical awareness, promotes pattern recognition, and reinforces learners’ ability to make data-driven generalizations about language use. In summary, DDL embodies a discovery-based and exploratory model of learning that aligns with modern pedagogical principles emphasizing learner autonomy and critical thinking. By engaging learners in corpus analysis, DDL not only strengthens collocational knowledge but also cultivates reflective, independent learners capable of navigating authentic language data. Consequently, DDL serves as a highly effective approach for fostering collocation acquisition and overall linguistic proficiency in EFL contexts.

C. Challenges and Limitations of Implementing DDL in EFL Contexts

Despite its documented advantages, the implementation of data-driven learning (DDL), particularly in EFL contexts, has been reported to present several challenges in the existing literature (e.g., Boulton, 2010; Yaemtui & Phoocharoensil, 2019). One of the main difficulties lies in the technical and cognitive demands associated with using concordance tools. Many learners, especially those in settings with limited access to digital technology, may not possess the digital literacy required to navigate corpus interfaces effectively (Boulton, 2010). Moreover, interpreting concordance lines often proves difficult for novice learners, who may find it challenging to extract meaning from fragmented language data presented without surrounding context.

A further obstacle concerns the availability and relevance of corpus resources. Although widely used corpora such as the *British National Corpus* and *COCA* are readily accessible, they may not always suit learners whose linguistic needs are shaped by different cultural or professional environments (Yaemtui & Phoocharoensil, 2019). For instance, Thai EFL learners might find such corpora less relatable, as they reflect varieties of English that do not align with local language use or communicative purposes.

The role of the teacher also becomes more complex in DDL-based instruction. Teachers are required not only to be familiar with corpus tools but also to design learning activities that match students’ proficiency levels and learning goals. In practice, however, many EFL instructors lack sufficient training in corpus linguistics, which limits their ability to integrate DDL into regular classroom practice (Yaemtui & Phoocharoensil, 2019).

Finally, DDL is often more time-consuming than traditional teaching methods. The process of analyzing concordance lines and identifying patterns takes considerable classroom time, which may conflict with fixed course schedules or

student expectations for rapid progress (Boulton, 2010). These constraints point to the need for thoughtful integration and support if DDL is to be effectively used in typical EFL classrooms.

III. METHODOLOGY

A. Research Questions

Guided by the gaps identified in previous related studies, the current study aims to explore both the effectiveness and the learner perceptions of integrating individual and cooperative DDL in teaching adjective–noun collocations to Thai EFL learners. To achieve these purposes, the study is framed by the following research questions:

1. To what extent does the integration of individual and cooperative DDL contribute to the development of Thai EFL learners' knowledge of English adjective-noun collocations?
2. What are Thai EFL learners' attitudes toward learning English adjective–noun collocations through individual and cooperative DDL?

B. Research Design

This study utilizes a quasi-experimental One-Group Pretest-Posttest Design. This approach minimizes threats to validity arising from potential external influences, such as intervening and extraneous variables, thereby supporting both validity and reliability (Creswell, 2002). The inclusion of both pre-test and post-test measures enhances the study's validity and reliability, as comparing these scores enables the assessment of improvement in participants' adjective-noun collocational knowledge. In other words, if participants' post-test scores are significantly higher than their pre-test scores, the observed difference can be attributed to the acquisition of adjective-noun collocations through the integration of individual and cooperative data-driven learning (DDL) activities.

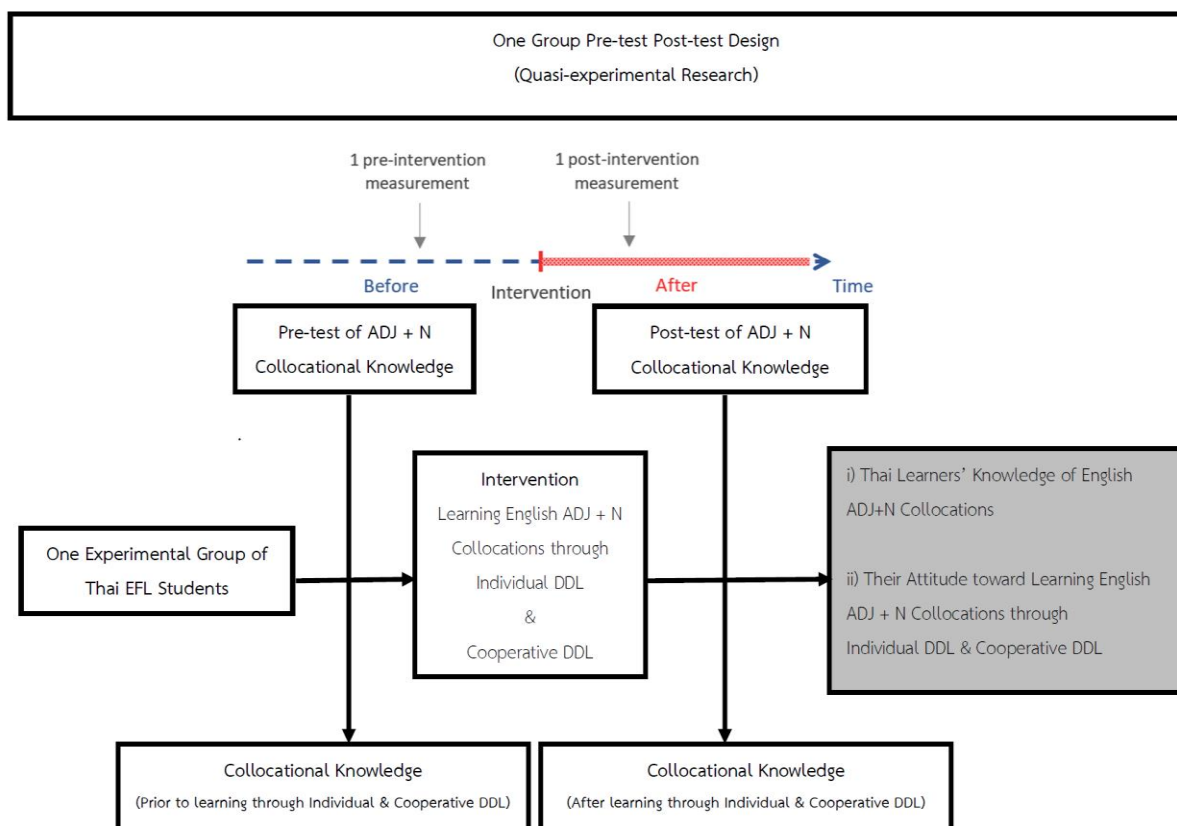


Figure 1. Research Design (A One-Group Pretest-Posttest Design)

C. Participants

The 50 participants were purposively selected from 4,500 undergraduate Thai students studying English at a Thai university, and convenience sampling was used to select the classes the researchers were assigned to teach. Additionally, the major criteria for selecting participants are that their first language be Thai and that they have studied English as a Foreign Language (EFL) for at least 12 years. Despite their experience in English language learning, none of the participants had any experience in learning English through DDL, nor were they familiar with using corpora to facilitate English language learning, especially collocations, prior to participating in the current study.

D. Data Collection

Prior to the intervention, which involved integrating individual and cooperative DDL activities for teaching adjective-noun collocations, the participants were asked to complete a pre-test measuring their knowledge of adjective-noun collocations. After completing the pre-test, the participants were required to attend 12-week collocation classes where the target adjective-noun collocations were taught through the integration of individual and cooperative DDL activities. The structure of each class is detailed below:

i) The first week consisted of a training session in which participants were instructed on learning collocations through both individual and cooperative DDL methods. After this training, participants completed the pre-test to evaluate their adjective-noun collocational knowledge prior to the intervention.

ii) From the second to the eleventh week, participants engaged in individual DDL activities during the even-numbered weeks (2nd, 4th, 6th, 8th, and 10th) and cooperative DDL activities during the odd-numbered weeks (3rd, 5th, 7th, 9th, and 11th). In these sessions, participants completed collocation exercises, including multiple-choice and gap-filling tasks. Both individual and cooperative DDL activities required participants to follow the DDL procedures of identification, classification, and generalization, and to consult the Corpus of Contemporary American English (COCA) to complete the tasks.

iii) After ten weeks of instruction, participants completed a post-test in the twelfth week. Post-test scores were compared with pre-test scores to assess improvements in collocational competence.

iv) Following the post-test, participants completed a questionnaire designed to investigate their attitudes toward learning collocations through the integration of individual and cooperative DDL activities.

v) One week after the post-test, five participants were purposively selected for interview sessions. These interviews provided qualitative data on participants' learning experiences and the problem-solving strategies they employed while learning collocations through integrated individual and cooperative DDL activities.

E. Data Analysis

The current study employs both quantitative analysis and qualitative analysis to investigate the effects of the integration of individual and cooperative DDL activities on adjective-noun collocation learning of Thai EFL learners and explore their attitudes towards this approach.

(a). Quantitative Data Analysis

The quantitative data analysis was conducted to give comprehensive answers to research questions 1 and 2. The following table summarizes the research questions and the analytical methods:

TABLE 1
THE SUMMARY OF QUANTITATIVE DATA ANALYSIS METHODS

Research Question	Data Source	Analytical Method
Research Question 1: To what extent does the integration of individual and cooperative DDL contribute to the development of Thai EFL learners' knowledge of English adjective-noun collocations?	Pre-test scores and Post-test scores	paired-samples <i>t</i> -test
Research Question 2: What are Thai EFL learners' attitudes toward learning English adjective-noun collocations through individual and cooperative DDL?	Questionnaire	<i>M</i> and <i>SD</i>

(b). Qualitative Data Analysis

Qualitative analysis of the semi-structured interview data provided comprehensive insights into participants' attitudes toward DDL and facilitated triangulation with the questionnaire results. The following table presents the research questions and corresponding analytical methods.

TABLE 2
THE SUMMARY QUALITATIVE DATA ANALYSIS METHODS

Research Question	Data Source	Analytical Method
Research Question 2: What are Thai EFL learners' attitudes toward learning English adjective-noun collocations through individual and cooperative DDL?	Semi-structured Interview Transcription	Thematic Analysis

IV. RESULTS

The results regarding the integration of individual and cooperative DDL as a learning innovation to promote the acquisition of adjective-noun collocations among Thai EFL learners are organized according to the two research questions:

(i) the extent to which the integration of individual and cooperative DDL contributes to Thai EFL learners' acquisition of English adjective-noun collocations (i.e., the quantitative data from the comparison between the pre-test scores and the post-test score), and

(ii) learners' attitudes toward the integrated DDL approach (i.e., the quantitative data obtained from the questionnaire and the qualitative data from the semi-structured interview).

A. To What Extent Does the Integration of Individual and Cooperative DDL Contribute to the Development of Thai EFL Learners' Knowledge of English Adjective-Noun Collocations?

The independent *t*-test was administered to compare between the mean score of the pre-test score and post-test score. To gain the detailed and comprehensive findings about the effectiveness of the integration of individual and cooperative DDL on enhancing Thai EFL learners' knowledge of adjective-noun collocations, the comparisons between the mean score of overall scores, multiple-choice scores, and gap-filling scores were also conducted. The comparison results are illustrated in Table 3 to Table 5.

TABLE 3
THE COMPARISON BETWEEN THE OVERALL PRE-TEST SCORES AND THE OVERALL POST-TEST SCORES

	Overall Score	<i>M</i>	<i>SD</i>	<i>t</i> -test	Sig.
Pre-test		6.05	0.32		
Post-test		9.23	3.18	5.82	0.00*

Based on Table 3, a paired-samples *t*-test was conducted to compare the overall pre-test scores and the overall post-test scores of participants. The analysis aimed to determine whether there was a statistically significant improvement in the participants' overall scores after learning English adjective-noun collocations through the integration of individual and cooperative DDL.

The results indicated a statistically significant increase in overall scores from the pre-test ($M = 6.05$, $SD = 0.32$) to the post-test ($M = 9.23$, $SD = 3.18$) with $t=5.82$ and $p = 0.00$. The significant *p*-value signifies the effectiveness of the integration of individual and cooperative DDL in improving the participants' overall knowledge of English adjective-noun collocations.

TABLE 4
THE COMPARISON BETWEEN THE MULTIPLE-CHOICE SCORE OF THE PRE-TEST AND THE POST-TEST

	Multiple-choice Score	<i>M</i>	<i>SD</i>	<i>t</i> -test	Sig.
Pre-test		3.78	1.29		
Post-test		6.63	3.02	5.53	0.00*

According to Table 4, a paired-samples *t*-test was administered to compare the participants' multiple-choice score of the pre-test and the post-test. The analysis aimed to determine whether there was a statistically significant improvement in the participants' multiple-choice scores after learning English adjective-noun collocations through the integration of individual and cooperative DDL.

The results indicated a statistically significant increase in the participants' multiple-choice scores from the pre-test ($M = 3.78$, $SD = 1.29$) to the post-test ($M = 6.63$, $SD = 3.02$) with $t=5.53$ and $p = 0.00$. The significant *p*-value indicates that the observed difference in means indicates the effectiveness of the integration of individual and cooperative DDL in improving the participants' receptive skills in mastering English adjective-noun collocations.

TABLE 5
THE COMPARISON BETWEEN THE GAP-FILLING SCORES OF THE PRE-TEST AND THE POST-TEST

	Gap-filling Score	<i>M</i>	<i>SD</i>	<i>t</i> -test	Sig.
Pre-test		2.28	1.69		
Post-test		2.60	1.41	1.24	0.22

With reference to Table 5, a paired-samples *t*-test was computed to compare the participants' gap-filling score of the pre-test and the post-test. The analysis aimed to determine whether there was a statistically significant improvement in the participants' gap-filling scores after learning English adjective-noun collocations through the integration of individual and cooperative DDL.

The results indicate a slight increase in the mean score from the pre-test ($M = 2.28$, $SD = 1.69$) to the post-test ($M = 2.60$, $SD = 1.41$). However, the paired-sample *t*-test revealed no statistically significant difference between the two test scores, $t = 1.24$, $p = 0.22$. The lack of statistical significance suggests that the integration of individual and cooperative DDL had a limited effect on enhancing participants' productive use of English adjective-noun collocations within the timeframe of this study.

B. What Are Thai EFL Learners' Attitudes Towards Learning Collocations Through the Integration of Individual and Cooperative DDL?

The following findings illustrate Thai EFL learners' attitudes toward learning English collocations through the integration of individual and cooperative DDL. The results of each questionnaire statement were analyzed and calculated to arrive at the means and standard deviations. The triangulation between the questionnaire data and semi-structured interviews is also illustrated for a comprehensive analysis of Thai EFL learners' attitudes towards learning collocations through the integration of individual and cooperative DDL.

TABLE 6
THAI EFL LEARNERS' ATTITUDES TOWARDS LEARNING COLLOCATIONS THROUGH THE INTEGRATION OF INDIVIDUAL AND COOPERATIVE DDL

Item	Thai EFL Learners' Attitudes Towards Learning Collocations Through the Integration of Individual and Cooperative DDL Statement	M	SD	Interpretation (Level of Agreement)
Learning English collocations through the integration of individual and cooperative DDL help me:				
1	Identify the similar patterns in English adjective-noun collocations	4.22	0.77	Agree
2	Identify the different patterns in English adjective-noun collocations	4.27	0.75	Agree
3	Categorize and group concordance lines	4.02	0.83	Agree
4	Construct patterns of English adjective-noun collocations	4.27	0.75	Agree
5	Improve knowledge of English adjective-noun collocations	4.27	0.85	Agree
6	Achieve learning goal and I would like to continue learning through this integrated approach	4.30	0.97	Agree

The findings in Table 6 reveal that learners perceived learning English collocations through the integration of individual and cooperative DDL as beneficial in several aspects. Statements 1 and 2 received high agreement levels, with mean scores of 4.22 ($SD = 0.77$) and 4.27 ($SD = 0.75$), respectively, indicating that learners perceived that the integrated DDL approach helped them identify both similar and different patterns in English adjective-noun collocations. Additionally, learners agreed that this approach supported them in categorizing and grouping concordance lines ($M = 4.02$, $SD = 0.83$) and constructing patterns of English adjective-noun collocations ($M = 4.27$, $SD = 0.75$). Furthermore, they recognized the approach's contribution to improving their knowledge of English adjective-noun collocations ($M = 4.27$, $SD = 0.85$). Lastly, the highest mean score ($M = 4.30$, $SD = 0.97$) was observed for learners' willingness to continue learning English collocations through this integrated approach, indicating a strong positive attitude toward the learning method.

The qualitative data obtained from the interviews reinforced the questionnaire findings, highlighting learners' positive perceptions of the integration of individual and cooperative DDL in enhancing their understanding of English adjective-noun collocations. Based on the interviews, five participants (100%) reported that they were able to identify both similar and different patterns of English adjective-noun collocations after learning collocations through the integration of individual and cooperative DDL:

I found it very helpful. Working individually allowed me to focus and analyze the patterns, while the group discussions helped me confirm my findings. For example, I noticed that words like "strong" and "argument" often appeared together, which showed me how certain adjectives and nouns naturally pair.

(S1's semi-structured interview)

Absolutely, I could easily identify the patterns after working through the concordance lines on my own. When we discussed them as a group, it became clear how some adjectives are interchangeable with certain nouns, but others aren't. Discussing with my friends helped me understand the structure better.

(S4's semi-structured interview)

Moreover, all five participants (100%) reported that the DDL approach helped them systematically categorize and group concordance lines.

When I worked individually, I could focus on specific examples, like grouping adjectives with similar meanings, such as 'strong,' 'serious,' and 'valid,' with nouns like 'argument.' Then, during group work, we discussed and refined our categories.

(S2's semi-structured interview)

It was much easier to understand the relationships between words when I could group them together. For instance, we grouped adjectives into 'positive' or 'negative' categories, which helped clarify their usage.

(S5's semi-structured interview)

Apart from categorizing and grouping concordance lines, five participants (100%) expressed that constructing patterns of adjective-noun collocations was a significant outcome of the integrated DDL activities.

I realized that adjectives like 'strong' and 'serious' often pair with abstract nouns like 'argument' or 'concern', which helped me build a pattern in my mind.

(S1's semi-structured interview)

Working in groups helped us see patterns that I missed when working alone. Together, we constructed rules, like which adjectives fit better with specific noun types.

(S3's semi-structured interview)

All participants (100%) acknowledged that their knowledge of English adjective-noun collocations improved as a result of the combined individual and cooperative DDL approach.

This method was very effective for improving my understanding. Before, I didn't know why certain adjectives and nouns went together, but now I see the patterns clearly.

(S4's semi-structured interview)

I think my knowledge improved because the activities forced me to look deeper into how words are used together in real examples.

(S5's semi-structured interview)

Additionally, the qualitative data obtained from interviews further supported the questionnaire results, particularly regarding learners' willingness to continue learning English collocations through the integration of individual and cooperative DDL. All five participants (100%) expressed the positive learning experiences and enthusiasm for continuing to learn English collocations through the integrated DDL approach due to its perceived effectiveness and engagement.

This method made learning collocations interesting and interactive. I would definitely like to use it again in future classes.

(S1's semi-structured interview)

This method has given me tools that I can use outside the classroom, which makes me excited to keep learning.

(S3's semi-structured interview)

Some participants (75%) expressed their preference of learning collocations through the integration of individual and cooperative DDL over traditional methods. They compared this approach with traditional methods of learning collocations, citing its hands-on and collaborative nature as a key advantage.

I've tried other ways of learning collocations, but this one is more engaging and effective. I'd prefer to use this method in the future.

(S5's semi-structured interview)

I enjoyed how the activities combined individual focus and group collaboration. It's much better than traditional learning methods, and I'd love to continue with it.

(S2's semi-structured interview)

In summary, the interview findings align with the questionnaire results, reinforcing the learners' strong positive attitudes toward the integrated DDL approach and their willingness to continue using it for learning English collocations. This combination of individual and cooperative learning activities was consistently described as engaging, effective, and motivating, further validating its potential as a valuable instructional method.

Overall, the integrated findings between questionnaire data and semi-structured interview data highlight that the integration of individual and cooperative DDL is perceived as an effective and engaging method for learning English collocations, particularly adjective-noun combinations, among Thai EFL learners.

V. DISCUSSION

A. The Effectiveness of Integration of Individual and Cooperative DDL as a Learning Innovation to Promote the Acquisition of English Adjective-Noun Collocations Among Thai EFL Learners

According to the empirical findings of this study, the integration of individual and cooperative DDL is regarded as an effective approach to enhance Thai EFL learners' overall knowledge of English adjective-noun collocations. Although the overall results demonstrate a positive effect, a more detailed analysis distinguishing between receptive and productive collocation skills reveals nuanced differences in impact. These results provide insights into the strengths, limitations, and pedagogical implications of the integrated DDL approach as an innovative strategy in EFL classrooms.

(a). Overall Development of English Adjective-Noun Collocational Knowledge

As evidenced by multiple assessments, this study demonstrates that integrating individual and cooperative DDL significantly improves Thai EFL learners' knowledge of English adjective-noun collocations. Quantitative data (Table 3) were analyzed using a paired-samples *t*-test, which revealed a significant improvement ($t = 5.82$, $p = 0.00$) between participants' pre-test ($M = 6.05$, $SD = 0.32$) and post-test scores ($M = 9.23$, $SD = 3.18$). These results indicate that the integration of individual and cooperative DDL is highly effective in facilitating the acquisition of English adjective-noun collocations. The findings of the present study confirm the positive outcomes reported in previous related studies, which highlighted the positive impact of DDL on enhancing learners' collocational proficiency.

In Thai educational contexts, Yaemtui and Phoocharoensil (2019) examined the contribution of DDL to the development of English collocational knowledge among high- and low-proficiency Thai EFL learners, finding that DDL supports overall collocational knowledge in both groups. Similarly, Sridhanyarat and Tangkiengsirisin (2025) confirmed the effectiveness of DDL, reporting that DDL based on the Involvement Load Hypothesis (ILH) produced a significant effect on Thai learners' academic collocation performance. Beyond Thai contexts, several international studies (e.g., Ashouri et al., 2014; Boulton, 2010; Chambers, 2005; Timmis, 2015) have also demonstrated that applying the DDL method in language classrooms, particularly for learning collocations, offers potential advantages for learners.

The current study's findings regarding the positive effects of DDL on collocational knowledge can therefore confirm those of several previous studies. Apart from the consistent findings, the current study also extends beyond previous studies by demonstrating the potential outcomes of integrating individual and cooperative DDL as a learning innovation to enhance Thai EFL learners' knowledge of adjective-noun collocations. These findings provide valuable insights into the effectiveness of the integrated DDL and its implications for language teaching.

(b). Significant Improvement in Receptive Skills

In addition to the overall development of English adjective-noun collocational knowledge, a detailed analysis of the participants' test scores—categorized into receptive and productive skills—was conducted to gain a more comprehensive understanding of the effectiveness of integrating individual and cooperative DDL.

In terms of the receptive skills, the results from the multiple-choice assessment (Table 4) provide strong evidence supporting the effectiveness of the integrated DDL approach in enhancing learners' receptive skills of collocational knowledge. The mean score for the multiple-choice questions, which primarily assesses recognition and understanding of English adjective-noun collocations, increased significantly from 3.78 ($SD = 1.29$) in the pre-test to 6.63 ($SD = 3.02$) in the post-test. This improvement was statistically significant ($t = 5.53$ and $p = 0.00$) indicating a substantial enhancement in receptive knowledge following the intervention. As multiple-choice items often evaluate learners' explicit knowledge of collocational patterns, the improvement in scores signifies an improved ability to recognize and identify appropriate uses of English adjective-noun collocations. This finding aligns with previous studies highlighting the advantages of DDL in improving learners' recognition of collocations (receptive skills); for example, Yaemtui and Phoocharoensil (2019) confirmed that DDL method provides positive effects on the development of the receptive skills in using English collocations of high-proficiency Thai EFL students. Another Thai-context study was conducted by Khemkullanat and Khongput (2023) who highlighted the significant improvement in collocational knowledge, including recognizing grammatical collocations; students could identify target patterns and classify types. In international contexts, Lewis (2000) also suggested that DDL allows learners to notice collocational patterns within the context of natural language, leading to better retention and recognition of those collocation patterns. By examining authentic language data in DDL activities, learners can observe and analyze how words naturally co-occur in different contexts, helping them identify and understand collocational patterns. This active engagement in analyzing the language can enhance learners' recognition of collocation patterns. The learners' ability to recognize collocations in new contexts is improved because they have developed a deeper understanding of how words combine based on the data they have analyzed during DDL activities.

(c). *Limited Impact on Productive Skills*

In contrast to the significant gains in overall and multiple-choice scores, the gap-filling scores (Table 5) demonstrated no statistically significant improvement. The mean score of gap-filling task increased slightly from 2.28 ($SD = 1.69$) in the pre-test to 2.60 ($SD = 1.41$) in the post-test, with $t = 1.24$ and $p = 0.22$. This finding suggests that while the integrated DDL approach supports the recognition and differentiation of collocations, its effect on productive tasks, like generating collocations in contexts, may require more time and practice to achieve measurable improvements. This result is aligned with Boulton (2010) who explained that DDL has a more noticeable positive impact on learners' receptive skills (like recognition) compared to their productive skills (like speaking or writing). Likewise, Haji et al. (2017) reported that Indonesian learners' productive performance in verb-noun and adjective-noun collocations remained weaker than their receptive performance, emphasizing the challenge of generating collocations spontaneously. Based on the findings of this study and previous studies, DDL is particularly beneficial for tasks that involve recognizing and understanding language; however, the act of producing language like writing and speaking also requires practice in using those structures and developing fluency. This suggests that more extensive exposure and practice, particularly in contextualized settings, may be necessary to help learners actively retrieve and produce collocations correctly. Chiranorawanit and Sripicharn (2024) emphasized that teacher scaffolding plays a critical role in helping learners move from noticing lexical patterns in concordance lines to applying them in authentic communicative contexts. Consequently, more extensive exposure, guided corpus exploration, and output-oriented activities—particularly those embedded in meaningful, contextualized tasks—might be required to enable learners to retrieve and produce collocations accurately and fluently over time.

B. *Thai EFL Learners' Positive Perceptions Towards Learning Collocations Through Integrated Individual and Cooperative Data-Driven Learning*

Based on the findings of this study, Thai EFL learners have positive attitudes towards learning English collocations through an integrated approach combining individual and cooperative DDL. Both the quantitative results from the questionnaire and the qualitative data from interviews consistently reveal that Thai EFL learners perceive this integrated DDL method as effective and engaging approach for identifying similar and different patterns of adjective-noun collocations as well as categorizing and grouping concordance lines for pattern construction. They also reported their willingness to continue using the integrated DDL approach for learning English collocations in wider contexts.

(a). *Facilitating Thai EFL Learners on the Process of Identifying Similar and Different Collocation Patterns*

One of the most significant findings is that the integration of individual and cooperative DDL substantially enhances Thai EFL learners' ability to identify both similar and different patterns of English adjective-noun collocations. With mean scores of 4.22 and 4.27, learners reported their positive perceptions towards how the integration of individual and cooperative DDL helps them recognize the recurring patterns in adjective-noun collocations. Complementing these quantitative insights, the interview data further confirms high satisfaction among the majority of Thai EFL learners regarding this learning method. During interview sessions, Thai EFL learners frequently reported that they could identify adjective-noun patterns after individually consulting concordance lines. Crucially, their subsequent cooperative

discussions as a group allowed them to confirm their initial observations and deepen their understanding of these collocation structures.

This finding aligns with previous research emphasizing the importance of identifying patterns in language learning. Many studies on DDL emphasize its inductive nature, where learners become ‘language researchers’ by analyzing authentic language data (Johns, 1991). This process inherently involves identifying patterns, similarities, and differences. He and Xie (2024), for example, investigated the effectiveness of DDL in teaching noun collocations to pre-tertiary Chinese learners of English using *Corpusmate*, an online corpus tool. Their study revealed that DDL significantly enhanced participants’ abilities to recognize collocation patterns after engaging with corpus-based tasks. Similarly, in Thai context, Khemkullanat and Khongput (2023) examined effectiveness of DDL in learning target grammatical collocations (verb-, adjective-, and noun-preposition collocations) to Thai undergraduate students. They confirm that DDL improved learners’ ability to accurately classify target collocational patterns as well as identifying the usage of the content words with varying prepositions.

(b). Enabling Thai EFL Learners to Categorize and Group Concordance Lines to Construct Adjective-Noun Collocation Patterns

In addition to helping learners identify similar and different patterns of adjective-noun collocations, the integration of individual and cooperative DDL also proved beneficial in facilitating learners categorize and group concordance lines to construct patterns of English adjective-noun collocations. The mean score of 4.02 reflects the learners’ agreement that this approach facilitated a more systematic analysis of collocations. Additionally, the qualitative data obtained from interviews indicate that most Thai EFL learners satisfy with the combined individual and cooperative DDL approach in facilitating the process of categorizing and grouping concordance lines to construct adjective-noun collocation patterns. Thai EFL learners in the current study specifically described their ability to categorize collocations into various groups, such as adjectives with similar meanings (e.g., ‘strong’ and ‘serious’) or those belonging to positive and negative categories. This process of grouping helps learners build a more understanding of how collocations function, which is an outcome also found in studies by McCarthy and O’Dell (2005), who advocated for the importance of grouping words based on their meanings and usage patterns. Also, the importance of constructing patterns in language acquisition has been highlighted by Ellis (2002), who suggested that pattern-based learning enhances fluency and accuracy, as learners can draw on these patterns when producing language. Overall, one of significant outcomes of the integrated DDL activities is enhancing learners’ ability to categorize and group concordance lines to understand adjective-noun collocation patterns as well as to apply the patterns they observed to guide their language production.

(c). Promoting Autonomous and Cooperative Learning Among Thai EFL Learners

The integration of individual and cooperative DDL is clearly an effective approach to promote one of core principles of DDL which is its potential in enhancing autonomous learning (Barabadi & Khajavi, 2017; Binkai, 2012). During interviews, the Thai EFL learners in this study explained that DDL provided opportunities to engage with authentic language data in the form of concordance lines, which facilitated their direct observation of linguistic patterns. This direct engagement fosters learners’ ability to recognize and use collocation patterns appropriately. As learners individually interact with diverse examples of collocation usage, they develop an independent understanding of how collocations function across various contexts. Consequently, the individual DDL approach allows learners to independently explore corpus data, thereby fostering learner autonomy and reducing reliance on teacher-centered instruction.

Additionally, while many DDL studies primarily highlight its potential to foster autonomous learning through individual learner interaction with concordances, this study recognizes the integration of individual and cooperative learning as an innovative pedagogical approach that promotes both autonomous and collaborative learning. Cooperative learning, in general, is believed to promote engagement, discussion, and co-construction of knowledge. In the context of DDL, Thai EFL learners in this study confirmed during the interviews that they have opportunity to collaboratively analyze concordance lines, discuss their observations, and collectively formulate rules or patterns. This cooperative component provides a supportive platform for shared observations, meaningful discussion, and collaborative construction of knowledge which would enrich and reinforce the individual discovery process.

In conclusion, the combination of individual and cooperative learning within a DDL framework can promote both self-discovery and collaboration among learners for the acquisition of English collocations. Thai EFL learners in this study expressed positive perceptions toward learning English collocations through this integrated approach. They indicated that the initial individual exploration facilitated personal discovery, while the cooperative phase provided peer feedback, error correction, and reinforcement of learned patterns. Overall, the integrated DDL approach creates an inclusive learning environment in which learners are positioned at the center of the learning process as active agents of self-discovery.

(d). Perceived Advantages and Willingness to Continue Using the Integrated DDL Approach Among Thai EFL Learners

Questionnaire data indicate that Thai EFL learners perceive the integration of individual and cooperative data-driven learning (DDL) as effective for improving their knowledge of English adjective-noun collocations, as reflected by a

mean score of 4.27. Qualitative interview data further support these findings, with participants noting that the integrated approach deepened their understanding of why specific adjectives and nouns co-occur. Learners also explicitly expressed willingness to continue using the integrated DDL approach, as evidenced by a mean score of 4.30. Interview responses revealed a strong preference for the integrated DDL over traditional teacher-centered methods. These positive perceptions are consistent with previous studies reporting favorable learner attitudes toward DDL in various EFL contexts. In particular, Thai EFL learners have identified DDL as engaging, motivating, and effective for language acquisition (Kulsitthiboon & Pongpairroj, 2018; Yaemtui & Phoocharoensil, 2019). Similarly, international studies demonstrate that learners value concordancing for vocabulary expansion and increased awareness of word aspects, including part-of-speech information, meanings, usages, lexico-grammatical structures, and collocations (Tosun & Sofu, 2023). The positive attitudes toward the integrated DDL approach further underscore the effectiveness of combining individual analysis with cooperative learning, a pedagogical strategy that enhances learner engagement, reinforces learning outcomes, and fosters sustained motivation for lifelong learning.

VI. CONCLUSION

This study investigated the effectiveness of the integration of individual and cooperative DDL in enhancing Thai EFL learners' knowledge of English adjective-noun collocations. The observed significant improvements in overall test scores and multiple-choice assessments validate the effectiveness of DDL in promoting the recognition and categorization of collocational patterns, a critical aspect of lexical proficiency. These results consistently align with existing literature on DDL's benefits for enhancing collocational knowledge and its positive impact on language learners' ability to recognize lexical structures.

However, the study also revealed that while the integrated DDL approach effectively facilitated the recognition of collocations, its impact on productive tasks, such as gap-filling exercises, was less pronounced. This suggests that while receptive knowledge can be effectively enhanced through DDL, transferring this knowledge into productive language use may require more extensive exposure and targeted practice.

In addition to the effectiveness of the integrated DDL approach on collocational knowledge, the study identified learners' positive attitudes towards this DDL approach. Learners particularly valued the interactive and engaging nature of DDL, which enabled them to analyze authentic language data, identify patterns, and internalize collocations. These findings contribute to the growing body of literature advocating for DDL as an effective pedagogy tool in second language acquisition.

Based on the findings, it is recommended that language educators should implement the integrated individual and cooperative DDL approach in their instructional practices. This approach can serve as a practical and flexible framework for enhancing learners' awareness of language patterns while simultaneously promoting independent exploration and peer collaboration. However, the study also revealed that while the integrated DDL approach effectively facilitated the recognition of collocations, its impact on productive tasks—such as gap-filling or sentence construction—was less pronounced. This suggests that although receptive knowledge can be significantly enhanced through DDL activities, transferring this knowledge into active, productive language use may require more extensive exposure, guided practice, and explicit opportunities for output-focused learning. Therefore, future classroom implementations of the integrated DDL approach should incorporate additional productive tasks that allow learners to apply and consolidate collocational knowledge in authentic communicative contexts.

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