

Bringing Data-Driven Grammar Learning into Lower Secondary Education:

A Comparative Evaluation of h-DDL

by Japanese Seventh Graders and University Students

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Abstract

Although data-driven learning (DDL) has shown positive effects in language learning, most empirical work has involved university students. Conventional DDL can be demanding for younger learners because authentic corpora may contain difficult language and concordance interfaces can impose a substantial operational burden. h-DDL was therefore developed as a web-based DDL application for grammar learning with a learner-friendly example-sentence corpus and simplified search functions. This study examined Japanese seventh-grade students' evaluations of h-DDL in comparison with students at two universities. Questionnaire data were obtained from 119 seventh graders, 24 students at University A, and 42 students at University B. Descriptive statistics showed similarly high ease-of-use ratings across the three groups ($M = 4.24, 4.21, \text{ and } 4.31$, respectively). Grammar was also rated highly ($M = 4.52, 4.79, \text{ and } 4.33$). Seventh graders rated vocabulary, listening, interaction, presentation, and writing more positively than both university groups, while their willingness to use h-DDL outside class was lower ($M = 3.50$ vs. 4.00 and 4.19). These findings suggest that h-DDL can be accessible to beginning-level secondary learners and may be most effectively introduced through structured classroom use before greater autonomy is expected.

Keywords: data-driven learning, grammar learning

1. Background

Data-driven learning (DDL) is an approach in which learners explore language data and use evidence to form or refine rules about language. Johns (1991) characterized learners as language researchers: instead of receiving rules of the target language from instructors, they observe examples, categorize features, and form generalizations about patterns. In traditional DDL, learners often search a corpus for a word with a concordancer and examine multiple occurrences of a word, phrase, or grammatical construction. The central pedagogical value lies in noticing patterns and rules that may be difficult to see in textbook examples and in basing grammatical discussion on actual language data.

A substantial body of research supports the potential of corpus use and DDL for second-language learning. Boulton and Cobb's (2017) meta-analysis examined 64 studies and 88 independent samples and reported overall effects for both experimental-control comparisons and pre-post designs. However, this evidence is unevenly distributed across educational levels. DDL research has been dominated by tertiary education. Learners at this level typically possess greater linguistic knowledge, academic literacy, and experience with independent learning than secondary-school learners. Pérez-Paredes (2022) also found that DDL research has mainly focused on university writing and concordance activities and stressed the importance of integrating DDL into the syllabus.

Several features of conventional DDL may help explain why it has been less widely used with beginning-level and younger learners. First, a concordance line may not provide enough context to understand the example. In addition, authentic sentences may contain unfamiliar vocabulary or complex syntax that can distract learners from the target feature. Second, traditional concordancers often include many search and filtering options. They also provide

frequency information and technical corpus terms. These features are useful for experienced users but can make the tools difficult for beginning-level learners to use. Third, beginning-level learners may notice useful patterns in the data but may not know enough grammatical terms to explain what they notice.

These difficulties do not mean that DDL is by nature unsuitable for secondary education. Rather, they point to the importance of age-appropriate data, constrained tasks, and mediation. Moon and Oh (2018), for example, studied guided DDL with Korean secondary EFL learners. The learners compared carefully selected examples from native-speaker and learner corpora. The study showed that this approach could support grammatical awareness and retention. Crosthwaite and Steeples (2024) similarly demonstrated the feasibility of corpus-assisted learning with secondary-school students when the intervention was sustained, curriculum-linked, and supported by explicit pedagogical design. Taken together, such studies suggest that the key question is not whether younger learners can use language data, but what kind of data, interface, and classroom instruction make that use effective.

The Japanese lower-secondary context provides a particularly relevant setting for examining this question. Seventh-grade students have only recently begun systematic and explicit study of English grammar and may still be developing basic routines for interpreting sentence structure. If DDL is introduced through tools designed primarily for university students, the learning task can be obscured by the difficulty of operating the tool or reading the corpus output. On the other hand, a tool that controls those demands could allow even novice learners to experience a fundamental DDL cycle: search, compare, notice, discuss, and generalize. The present study therefore focuses on learners' evaluations of

h-DDL, an application designed specifically to reduce the gap between the pedagogical promise of DDL and the practical constraints of secondary classrooms.

2. h-DDL: A DDL Application for Secondary-School Learners

2.1 Design Features of h-DDL

h-DDL was developed as a web-based DDL application for English grammar learning, with secondary-school learners and beginning-level EFL users as the target (Nishigaki and Akasegawa, 2023; Nishigaki, et al., 2026). The application is available online without registration, allowing learners and teachers to access the tool immediately. This accessibility also makes h-DDL easy to use in classrooms; Teachers don't need to create an account.

In addition to being easy to access, neither teachers nor students need to create an account. The parallel corpus contains complete example sentences that are appropriate for learners' proficiency levels. This is different from conventional concordances, which show learners incomplete lines from texts written for native speakers. h-DDL allows learners to compare examples and find language patterns. It also makes each example easier for beginning-level learners to understand.

As shown in Figure 1, h-DDL displays complete English sentences with Japanese translations. This helps learners compare language patterns and understand the meaning of each sentence. This L1 support reduces cognitive load and allows learners to focus on noticing language patterns and sentence structures. In this way, h-DDL keeps the basic DDL approach of comparing examples and discovering language patterns. At the same time, it makes each example easier for beginning-level learners to understand.



<https://h.ddl-study.org/>

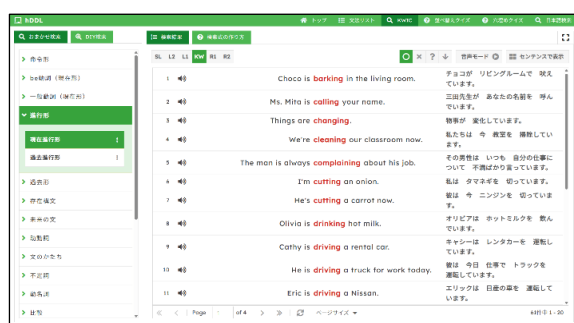


Figure 1: Sample h-DDL search-results screen: present progressive.

The simplified interface also narrows the distance between a grammatical question and the evidence needed to explore it. Learners can use *Auto Search* for ready-made searches or *DIY Search* (Do It Yourself Search) for more self-directed exploration. Audio playback supports access to the sound form of examples; Japanese translations help

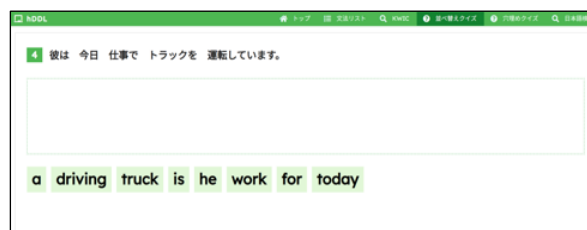


Figure 2: Sample word-ordering quiz screen.



Figure 3: Sample fill-in-the-blank quiz screen.

learners confirm the meaning of the sentence and any unknown words. h-DDL also provides a way to move from observation to manipulation of sentences: word-ordering quiz (Figure 2) and fill-in-the-blank quiz (Figure 3).

In the word-ordering quiz, students read English words and arrange them using words to show proper English sentences based on the Japanese equivalents. In the fill-in-the-blank quiz, students fill in the blanks based on L1 translation.

Pedagogically, h-DDL is intended to support a continuum from strongly guided noticing to more autonomous noticing. A teacher can begin with a shared search, ask students to identify a repeated word or form, and then prompt pairs or groups to compare examples. Later, learners can conduct a related search themselves or use the results to test a hypothesis about word order or grammatical meaning. Autonomy in this model is therefore gradual. The aim is not to remove the teacher from grammar learning. Instead, learners take a more active role in learning. Teachers still provide explanations, guidance, and feedback when needed.

2.2 Why Usability Matters for DDL

For younger learners, usability is important for learning. If a tool is difficult to use, students may have less attention for examining the language itself. A learner-friendly tool should therefore reduce operational burden without reducing the core analytical activity of DDL. In h-DDL, the search process is simplified, but the learner still has to examine several examples and decide what they reveal about a grammatical pattern. This difference is the reason for comparing the groups in this study.

University students provide useful reference groups because they represent the population most commonly associated with corpus-based learning. If seventh graders judge h-DDL as similarly easy to use, the finding would suggest that interface simplification and pedagogical corpus design can reduce age-related operational barriers. At the same time, ease of use does not necessarily imply a desire for independent use. For that reason, the study also examines willingness to use h-DDL outside class and compares the results across the three groups of DDL users.

3. Research Questions and Method

The purpose of this study was to examine whether a DDL tool designed for beginning-level learners is perceived as usable and useful by Japanese seventh graders, and to compare their evaluations with those of university students. Accordingly, three research questions were set.

Research Questions

RQ1. How do Japanese seventh-grade students evaluate the usability of h-DDL compared with the two university groups?

RQ2. How do Japanese seventh-grade students and the two university groups differ in their perceptions of the usefulness of h-DDL for English grammar learning and other language skills?

RQ3. How does willingness to use h-DDL outside the classroom differ across the three groups, and what does this pattern suggest about the implementation of h-DDL in lower secondary classrooms?

3.1 Participants

Participants were 119 Japanese seventh-grade students and 66 university students from two institutions: University A ($n = 24$) and University B ($n = 42$). The seventh graders attended a research junior high school affiliated with a university faculty of education. Because educational research is regularly conducted at the school, written consent for participation in school-based educational research had been obtained from all parents or guardians at the time of enrollment. The university participants in both groups were second-year undergraduates enrolled in an English teaching-methods course as part of teacher certification and may therefore have had relatively high interest in English and language learning and teaching. Before the survey, they were informed about the study and provided written informed consent. The two university samples were used as reference groups rather than matched control groups.

The groups differed in educational experience and likely also in English proficiency; therefore, the university samples were treated as descriptive reference groups, and group differences were not attributed to age alone.

Group	n	Context
7th graders	119	Lower secondary
University A	24	Teacher education
University B	42	Teacher education

Table 1: Participant groups.

Note. University A and University B are retained as separate reference groups throughout the descriptive analysis.

3.2 Questionnaire

The questionnaire used a five-point response format. The present analysis focuses on the nine h-DDL evaluation items reported in Table 2: ease of use, willingness to use h-DDL outside class, and perceived usefulness for grammar, vocabulary, listening, interaction, presentation, reading, and writing. These items capture operational usability,

willingness for independent use, and perceived instructional usefulness across language-learning areas.

The nine items were examined individually rather than combined into a single scale because they represent conceptually different aspects of h-DDL use. The usefulness items therefore indicate learners' perceptions of possible support for each area, not demonstrated gains in language performance in the classroom.

3.3 Analysis

The analysis was descriptive and was based on the item-level means (M) and standard deviations (SD) for all three groups. For each of the nine h-DDL evaluation items, Table 2 reports M (SD) for the seventh graders, University A, and University B. To examine the between-group pattern, the seventh-grade mean was compared separately with the mean for each university group (Grade 7 minus University A and Grade 7 minus University B). Positive differences indicate higher ratings among seventh graders, whereas negative differences indicate higher ratings in the relevant university group. These mean differences are used only as descriptive indicators; they are not inferential statistics or effect sizes.

The analysis was organized around the three research questions: (a) ease of use, (b) perceived usefulness for grammar and the other language-learning areas, and (c) willingness to use h-DDL outside class. In addition, the average of the seven usefulness items from grammar through writing was calculated for each group. Because this average was derived from item means, it is not treated as a validated composite score.

4. Results

4.1 Usability and Willingness to Use h-DDL

For RQ1, ease-of-use ratings were very similar across all three groups. Seventh graders rated h-DDL at $M = 4.24$ ($SD = 0.92$), compared with $M = 4.21$ ($SD = 0.78$) for University A and $M = 4.31$ ($SD = 0.89$) for University B. The seventh-grade mean was only 0.03 points above University A and 0.07 points below University B. On the five-point response format, all three means were high. Descriptively, therefore, the seventh graders showed no clear disadvantage in operating the application despite being at a much earlier stage of formal English education.

Ease of use did not translate directly into willingness to use h-DDL independently outside class. Seventh graders reported $M = 3.50$ ($SD = 1.16$), compared with $M = 4.00$ ($SD = 0.98$) for University A and $M = 4.19$ ($SD = 1.01$) for University B. The seventh-grade mean was therefore 0.50 points lower than University A and 0.69 points lower than University B. The seventh-grade standard deviation was also somewhat larger than those of the two university groups, suggesting greater variability in responses to out-of-class use. This contrast suggests that operational accessibility and willingness for self-initiated use should be treated as distinct aspects of feasibility.

4.2 Perceived Usefulness for Grammar and Other Skills

The h-DDL evaluation results for the three groups are shown in Table 2.

Item	7th Graders <i>M</i> (<i>SD</i>) <i>n</i> =119	Univ. A <i>M</i> (<i>SD</i>) <i>n</i> =24	Univ. B <i>M</i> (<i>SD</i>) <i>n</i> =42
Easy to use	4.24 (0.92)	4.21 (0.78)	4.31 (0.89)
Use outside class	3.50 (1.16)	4.00 (0.98)	4.19 (1.01)
Grammar	4.52 (0.62)	4.79 (0.41)	4.33 (0.99)
Vocabulary	4.25 (0.88)	3.83 (0.92)	3.81 (1.16)
Listening	4.17 (0.88)	3.88 (0.85)	3.52 (1.12)
Interaction	3.76 (0.91)	3.17 (0.96)	3.43 (1.24)
Presentation	3.71 (1.04)	3.42 (0.78)	3.43 (1.09)
Reading	4.07 (0.85)	4.25 (0.74)	4.00 (0.87)
Writing	3.97 (0.96)	3.79 (0.98)	3.62 (1.13)

Table 2: Descriptive evaluation of h-DDL by group.

Note. All ratings use a five-point response format.

Grammar received the highest usefulness rating in each group. Seventh graders rated h-DDL's usefulness for grammar at $M = 4.52$ ($SD = 0.62$), University A at $M = 4.79$ ($SD = 0.41$), and University B at $M = 4.33$ ($SD = 0.99$). Relative to the seventh graders, University A was 0.27 points higher, whereas University B was 0.19 points lower. Thus, although the exact ordering differed across institutions, all three groups clearly recognized grammar learning as a central use of h-DDL.

A more distinctive pattern appeared in the other skill areas. Seventh graders rated h-DDL more positively than both university groups for vocabulary ($M = 4.25$; +0.42 vs. University A, +0.44 vs. University B), listening ($M = 4.17$; +0.29, +0.65), interaction ($M = 3.76$; +0.59, +0.33), presentation ($M = 3.71$; +0.29, +0.28), and writing ($M = 3.97$; +0.18, +0.35). The pattern was therefore not dependent on comparison with only one university group. In particular, vocabulary and listening received high absolute ratings from the seventh graders.

Reading showed a different pattern. The seventh-grade mean of $M = 4.07$ ($SD = 0.85$) fell between University A at $M = 4.25$ ($SD = 0.74$) and University B at $M = 4.00$ ($SD = 0.87$). Across the seven usefulness items from grammar through writing, the average of the item means was 4.06 for seventh graders, 3.88 for University A, and 3.73 for University B. Among the seventh graders, responses showed relatively large variation for presentation ($SD = 1.04$) and willingness to use h-DDL outside class ($SD = 1.16$).

Within the seventh-grade group, grammar showed the smallest standard deviation among the seven usefulness items ($SD = 0.62$), indicating comparatively strong agreement about its value. Presentation was more variable ($SD = 1.04$), and willingness to use h-DDL outside class was more variable still ($SD = 1.16$). University B also showed relatively wide dispersion on several items, including interaction ($SD = 1.24$), vocabulary ($SD = 1.16$), and writing ($SD = 1.13$). These results show that group means represent overall trends, but individual responses varied within each group.

5. Discussion

5.1 Feasibility Through Age-Appropriate Design

The first contribution of the study is evidence that a DDL interface designed for beginning-level learners can be perceived as accessible at the beginning of secondary English education. 'Ease to use' ranged only from 4.21 to 4.31 across the three groups, with the seventh graders at 4.24. This finding does not show that every form of corpus consultation is equally easy for younger learners. Rather, it shows that the seventh graders rated h-DDL as about as easy to use as the two university groups did. This pattern is consistent with the view that learner-oriented corpus and interface design can reduce barriers for beginning-level learners.

h-DDL addresses this mismatch at several levels. Complete example sentences reduce the fragmentary character of concordance lines, Japanese translations provide semantic support, Auto Search reduces the need to formulate precise corpus queries, and audio adds access to the spoken form of examples. Word-order quizzes also provide a transition from observation to practice. These features lower demands while retaining the central DDL activity of comparing examples and noticing patterns. The high grammar ratings in all three groups suggest that learners recognized this intended function.

5.2 Broad Perceived Usefulness Among Seventh Graders

A second contribution is the breadth of the seventh graders' positive evaluations. They rated vocabulary, listening, interaction, presentation, and writing more highly than both university groups. Because the same direction appeared against two separate university groups, the pattern is more stable than a single-group comparison would suggest. It should not, however, be treated as an effect of age: the groups differ in educational experience, proficiency, institutional context, and likely expectations about the tool.

One plausible interpretation is that complete example sentences make grammatical evidence available as multipurpose language input. A learner who searches the present progressive is simultaneously exposed to verbs, collocations, sentence meanings, and pronunciation through audio as well as possible models for speaking or writing. When the same evidence is discussed or used in a short production task, the activity can extend from noticing a form to using it. The seventh-grade ratings therefore support examining h-DDL as a bridge between grammar-focused DDL and broader classroom language work, while future studies must test whether these perceptions correspond to learning outcomes.

The result is also related to curriculum integration. Pérez-Paredes (2022) proposed that normalization of corpus use depends on more than access to technology. A school application is more likely to become sustainable if teachers can use it to ordinary lesson goals. The present ratings indicate some possible points: vocabulary expansion from searched examples, listening to the same examples, discussion of patterns, short presentations of findings, reading-based comparison, and sentence production. However, these are not claims that h-DDL improves all skills by itself.

5.3 Ease of Use Is Not the Same as Autonomous Use

The seventh graders rated h-DDL as easy to use, but they were less willing to use it outside class. Although the application was rated as easy to use, willingness for out-of-class use was 0.50 points below University A and 0.69 points below University B. The seventh graders rated h-DDL as easy to use, but they were less willing to use it outside class. For beginning secondary learners, a more realistic sequence may be to establish meaningful classroom routines first and then gradually create more independent use.

Such an approach is also consistent with the pedagogical rationale of h-DDL. Teachers can initially make a focused question and model how to search for examples, after which learners can compare evidence and find a possible pattern. As students become familiar with the search process, DDL work can gradually shift toward DIY searches, short production tasks, or optional use outside class. In this way, autonomy is treated as a developmental outcome rather than as a prerequisite for successful DDL participation.

5.4 Steps for Classroom Use

This cycle translates the questionnaire pattern: high perceived usability, strong grammar usefulness, broader perceived usefulness, and more moderate willingness for out-of-class use. It is pedagogical rather than a direct test of learning outcomes.

The four-phase h-DDL sequence FISH (Nishigaki, Mizumoto and Watari, 2026), shown in Table 3, illustrates how the findings can be applied in the classroom. DDL begins with support because seventh graders are new both to formal English grammar study and to corpus consultation. Guided comparison then gives learners a chance to explain what they notice. A whole-class sharing stage makes the teacher's explanatory role explicit without turning the activity back into rule-first instruction. Finally, a small extension introduces autonomy as a reachable next step rather than a prerequisite for participation.

Phase	Teacher role	Learner role
1. Find	Teacher demonstrates Auto Search and verbalizes what to notice.	Students identify repeated forms in a small set of examples.
2. Interact	Teacher provides a focused question and a limited search target.	Pairs compare examples, translations, and audio; they propose a pattern.
3. Share	Teacher gathers and organizes students' ideas and clarifies misunderstandings.	Students justify a rule with evidence and discuss differences.
4. Have a go	Teacher invites a related DIY Search or short production task.	Students test the rule, collect examples, or create a sentence; outside use is optional.

Table 3: Suggested Steps for integrating h-DDL into lower-secondary grammar lessons.

The sequence also allows teachers to manage task demands. When the grammatical target is new, the search can be highly constrained, and the Japanese translation can remain visible. When the target is familiar, learners can compare more examples or use DIY Search. Audio can be incorporated when the lesson goal includes form-sound mapping, while a short production task can connect a discovered pattern to writing or speaking. In this way,

hDDL can support different degrees of guidance without abandoning the logic of DDL.

5.5 Implications for DDL Research and Tool Design

The findings suggest three implications for DDL research. First, evaluations of school-based corpus tools should distinguish operational usability from willingness to use it autonomously outside class: a tool can be easy to operate while learners remain less inclined to use it independently outside class. Second, learner evaluations should examine perceived usefulness beyond a tool's nominal target. The Grade 7 responses indicate that a grammar-search application may also be experienced as relevant to vocabulary, listening, interaction, presentation, and writing. Third, the differences between University A and University B on several items show that 'university students' should not automatically be treated as a homogeneous benchmark; institutional samples are better reported separately unless pooling is empirically justified.

For tool design, the results favor progressive disclosure rather than maximal functionality on the first screen. Beginning-level learners benefit when common searches are easy to launch, meanings can be checked quickly, and the number of decisions required before seeing useful evidence is small. More advanced functions can remain available for later use. This principle fits the developmental aim described by Nishigaki and Akasegawa (2023): nurturing learners who can eventually use corpora more autonomously without requiring them to begin with the complexity of a professional concordancer.

6. Limitations and Future Directions

These limitations should be considered when interpreting the results. Most importantly, the analysis is based on descriptive statistics. High usefulness ratings do not demonstrate gains in grammatical accuracy, vocabulary knowledge, listening, or other skills. Future research should pair questionnaire data with performance measures so evaluations can be linked to learning and retention. Learner interviews would also help explain why particular functions were perceived as useful.

Second, the groups were not matched for age, proficiency, educational experience, or institutional context. Both university groups were second-year students taking an English teaching-methods course for teacher certification. This background may have influenced their evaluations, so they may not represent university students in general. Descriptive differences between seventh graders and university students therefore cannot be attributed to age alone. Future comparative studies should collect common background measures and, where possible, use more closely matched tasks and participant groups.

Third, future studies should examine actual search behavior. Log data could reveal which functions seventh graders use, how long they inspect results, whether they play audio or consult translations, and how their search choices change after repeated classroom experience. Such behavioral evidence would be especially valuable for evaluating the developmental goal of autonomous corpus use and for determining whether repeated guided use leads to more independent and strategically motivated searches.

7. Conclusion

This study examined how Japanese seventh-grade students evaluated h-DDL, a learner-oriented DDL application, in comparison with two university reference groups. Ease-of-use ratings were similarly high across the three groups ($M = 4.24$ for Grade 7, 4.21 for University A, and 4.31 for University B), suggesting that the younger learners did not experience a clear disadvantage. Grammar was rated highly in all three groups ($M = 4.52, 4.79$, and 4.33), and seventh graders rated vocabulary, listening, interaction, presentation, and writing more positively than both university groups.

8. Acknowledgments

The development, operation, and maintenance of h-DDL have been supported by JSPS KAKENHI Grant-in-Aid for Scientific Research (B), Grant Number JP24K00083 (Principal Investigator: Chikako Nishigaki).

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At the same time, accessibility should not be equated with immediate independence. Seventh graders' willingness to use h-DDL outside class was more moderate ($M = 3.50$) than that of University A ($M = 4.00$) and University B ($M = 4.19$). The results therefore support introducing h-DDL as an evidence-rich classroom resource with substantial initial guidance and gradually increasing opportunities for independent use. By reducing the linguistic and interface burden of conventional corpus tools while preserving the process of noticing patterns in data, h-DDL provides a practical route for introducing DDL earlier in learners' English education.