

「研究ノート」

Development and Revision of DDL Tools for Secondary School Students: What We Can Do to Nurture Autonomous Corpus Users?

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Abstract

While the effectiveness of using data-driven learning (DDL) has been well established, it has been mainly used with university level learners. In an effort to harness these advantages with younger learners, two specialized corpora and tools (eDDL and hDDL) have been developed and implemented over a number of years, called the DDL Project. In this paper, we provide an overview of our approach in developing and modifying hDDL, and describe the four stages undertaken to help students transition from using pedagogically modified corpora with teacher support to being able to use authentic corpora independently. Our goal has been not only to be able to implement DDL in EFL classes at the secondary school level to improve learners' knowledge of grammar, but to support learners in developing the skills to understand and navigate corpora themselves in order to go beyond prescribed grammatical targets to use corpora to address any language curiosities they may have. To further this goal, both eDDL and hDDL are available without cost or registration, so learners and teachers can access these online at any time.

1. Introduction

Data-driven learning (DDL) is a corpus-based foreign language teaching method said to be “the most promising applications of corpus linguistics” (Wicher, 2020, p. 31). With the support of a Japan Society for the Promotion of Science (JSPS) Grant-in-Aid for Scientific Research, we began a research project (called the DDL Project) for secondary school learners in 2013 and expanded this to elementary schools in 2016. This DDL Project had three initial goals: creating pedagogical corpora suitable for

elementary and secondary school learners, developing and revising appropriate corresponding corpus search tools and implementing DDL using these tools in school settings (Nishigaki et al., 2020, 2022). The developed tools are eDDL for elementary school (<https://e.ddl-study.org/>) and hDDL for secondary school or high school (<https://h.ddl-study.org/>). This current article describes our subsequent focus: the development and revision of the hDDL tool, which is intended to achieve the long-term goal of fostering future independent corpus users. Section 2 of this paper provides the background of our DDL project. Section 3 describes the development of the hDDL tool, and section 4 discusses the latest revisions. We provide an analysis of the revisions in section 5 and a conclusion in section 6.

2. Background

DDL is a means to apply corpus linguistics methods to language teaching. A learner searches a corpus to discover patterns and rules of a language, and constructs and learns knowledge about the language in his or her own way, just as a linguist would. In DDL classrooms, the learner's mission is to discover language facts and to modify or replace previous knowledge with new knowledge on his or her own, while the teacher's role is to help the learner discover facts and build new knowledge. This characteristic of DDL overlaps with the constructivist view of learning and with the Japanese Ministry of Education's (MEXT) "course of study" (Suzuki, 2021).

DDL, first proposed by Johns (1991), can be applied to a wide range of areas in foreign language learning; for example, to learning vocabulary (Tsai, 2019), collocations (Saeedakhtar et al., 2020), grammar (Lin, 2021; Mull & Conrad, 2013; Vyatkina, 2013), and writing (Elmansi et al., 2021). It can be used in various ways; for example, the language data can be computer-based, wherein users explore a corpus on a screen, or paper-based, wherein text data is pre-selected and printed for users (Gabrielatos, 2005); and the corpora can be parallel (comparing two languages) or monolingual. The effectiveness of DDL has been well established by a number of studies, including three meta-analyses (Boulton & Cobb, 2017; Lee et al., 2019; Mizumoto & Chujo, 2015).

Although DDL has many applications and has been shown to be effective, it is also the case that it is used primarily with university students or intermediate and

advanced level learners. The use of DDL at the pre-tertiary level is not widespread (Crosthwaite, 2020). One reason for this is that there are no corpora suitable for pre-tertiary groups (Perez-Paredes, 2020). Furthermore, the use of simplified corpora has been criticized, for example, by Sinclair (1991, p. 6), who believed the authenticity of corpora is paramount: “One does not study all of botany by making artificial flowers.” Gabrielatos (2005) rebutted this thinking as problematic “corpus worship” (p. 20). We believe that if DDL is to be accessible to and effective with younger learners, appropriate corpora need to be created and used, at least initially, so learners can understand what corpora is and how to navigate it. In other words, there needs to be a bridge from using a simplified corpus to eventually using authentic corpora.

A second problem that hinders DDL implementation is the difficulty students have in using DDL search software. DDL requires a corpus, appropriate software, the ability to use that software, and a user-friendly interface (Timmis, 2015). However, secondary school learners and teachers new to DDL are not accustomed to using currently available corpus search software. For these reasons, the search software needs to be as simple and user-friendly as possible.

To address these issues, Chujo et al. (2015) developed the Sentence Corpus of Remedial English (SCoRE), which is a simplified DDL tool that was created for beginner level EFL university students. The English sentences in SCoRE were created from a specially made source corpus (a collection of beginner level English) and each concordance line is an independent and complete sentence. SCoRE was created as a needs-driven, classroom-ready resource, which is easy to use for both learners and teachers. Learners can search for English sentences containing a target grammatical item within a simple interface.

3. Development of Secondary School DDL Tools

Based on the results of second language acquisition (SLA) research, the Japanese course of study encourage English classes to be taught with a meaning-oriented approach (MEXT, 2017). However, while meaning-oriented interaction may result in better communication ability, communication without attention to language forms does not necessarily improve linguistic accuracy (Loewen, 2020). Therefore, English teachers need to consciously direct their students’ attention to grammatical items in the

classroom while keeping the emphasis on communication. Since DDL explicitly and inductively teaches grammatical knowledge, we considered DDL to be an effective teaching method for grammar. As a result, we incorporated DDL into pre-tertiary level communicative English classes to teach grammar.

3.1 Setting DDL Goals

When conducting pedagogical activities, it is essential to set educational goals to define the abilities to be developed in learners. Our initial goal for the DDL Project was to create a level-appropriate pedagogical corpus, develop a user-friendly corpus search tool, and implement these to measure effectiveness and understand how these could be modified to be more effective. In this next stage of the DDL Project, our focus has been to continue to evaluate and modify these tools, but also to explore how to nurture secondary school learners in using DDL such that although they begin with a simplified pedagogical corpus and teacher support, they eventually are able to use authentic corpora independently. These goals are shown in Table 1, with timeframes divided into short-term, medium-term, and long-term goals according to the time it may take to achieve them.

Table 1. Pedagogical Goals for the DDL Project

Short-term goal	Developing grammatical knowledge
Medium-term goal	Developing the ability to observe language
Long-term goal	Developing into autonomous corpus users

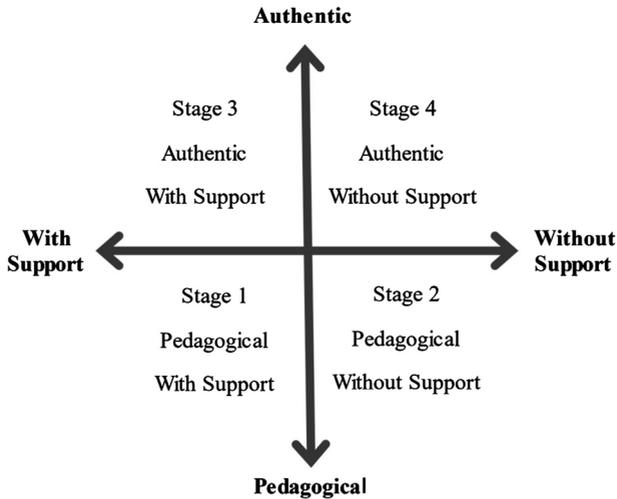
The short-term goal is to understand and acquire knowledge of the grammatical rules of the learning target, to be achieved in one class or one unit in the textbook (see previous studies Kakiba et al., 2021; Nishigaki et al., 2021; Nishigaki & Kakiba, 2023). The medium-term goal is to develop students' ability to observe English by asking themselves at what and how they look at the language when a question comes into their minds, and is achieved through the continuous implementation of DDL in class across a semester or a year (Nishigaki et al., 2018). The long-term goal is to develop autonomous corpus users. Since a variety of corpora can be accessed online, this is the ability to identify a corpus and obtain the information they need to solve their

language-related question. Developing autonomous corpus use would be a lifelong language learning skill.

3.2 Setting the DDL Stage

One of the strengths of DDL is that it provides the learner with large amounts of authentic data, and learners can see how language is actually used. A corpus based on authentic data is effective because the language is more closely related to learners' needs and interests, and can enhance students' motivation, cover current issues, and support a more creative approach to teaching, among other benefits (Beresova, 2015). However, this strength of DDL—its authenticity in raw form—can be a disadvantage for beginning and elementary level learners because authentic corpora usually contain complex grammar, high level vocabulary, and multiple grammatical exceptions and are therefore challenging for lower level language learners. To create a bridge to authentic corpus use, pedagogical intervention is necessary. There are a variety of possible pedagogical interventions; for example, one is for the instructor to support the learner by selecting and presenting a corpus that is level-appropriate. For learners who are unfamiliar with the particular language format of concordance lines or who do not yet have sufficient linguistic knowledge of the target language, it is helpful to give them clues that elicit discovery. With these interventions in mind and in keeping with the goal of developing independent corpus users (see Table 1), we divided the learning progression into four stages (see Figure 1). The vertical axis is the type of corpus: authentic or pedagogical. The horizontal axis is the level of pedagogical intervention provided by the teacher (e.g., whether the learner is given a search guide).

In Stage 1, learners use the pedagogical corpus with teacher assistance. In Stage 2, learners use a pedagogical corpus without teacher assistance. In Stage 3, learners use an authentic corpus with teacher assistance. In Stage 4, learners use an authentic corpus without teacher assistance. We are applying these four stages to the context of English education in Japan as follows. Students begin to learn grammar in explicit ways in the 7th grade and learn English each year up to the 12th grade using government-approved textbooks. The 7th to 12th grades (secondary school) are divided into two categories in Japan: the 7th to 9th grades are junior high school, and the 10th to 12th grades are high school. Therefore, Stage 1 and Stage 2, which use pedagogical corpora, can be applied to 7th to 9th grades and 10th to 12th grades, respectively. The A1 level of the Common



The chart was revised from Nishigaki et al. (2015).

Figure 1. DDL Stages

European Framework of Reference for Languages (CEFR) is the MEXT goal for students by the time they graduate from the 9th grade, and the A2 level by the time they graduate from the 12th grade. Thus, as a rough guide, Stage 1 corresponds to the CEFR A1 level, and Stage 2, the CEFR A2 level. In university, teachers are free to choose their teaching materials, allowing students to have more opportunities to learn authentic English. Since authentic English is more challenging, students in their first and second years of university are ideally in Stage 3 and work on DDL using authentic English with support from their instructors. Then, in the third and fourth years, students will move on to Stage 4, where they perform DDL autonomously, using authentic English. In Japan, university students aim for Society for Testing English Proficiency (STEP) pre-1st and 1st grade, which correspond to CEFR B1 and B2. Therefore, we can consider Stage 3 as corresponding to the CEFR B1 level, and Stage 4, B2 and above. Although English education begins in the 3rd grade in Japan, students learn English primarily through oral English until 6th grade, with little explicit instruction on English grammar. Therefore, our eDDL tool for elementary school students, which is the sister version of hDDL, would be incorporated into classes at the Pre A1 level at Stage 1.

The above target settings may seem low by world standards. In the Japanese language use environment, exposure to English is limited to English classes at school, and almost all daily life is conducted in Japanese. In other words, students learn English as a foreign language (EFL), so the goal setting is lower than in ESL (English as a Second Language) countries, where English is used inside and outside of school. Furthermore, according to Allan (2009), among authentic materials, English for Specific Purposes (ESP) corpora are easier than general-purpose corpora such as the British National Corpus (BNC) because ESP is more accessible and relevant to students. Learners at the B1 and B2 levels are unlikely to be able to deal with the peripheral linguistic content of general-purpose corpora. Therefore, ESP corpora and general-purpose corpora need to be considered separately among authentic data.

To date, most students we have worked with at secondary schools are at Stage 1 in Figure 1. However, when one of the authors observed an 8th grade DDL class, it was found that students who had become familiar with using DDL tools voluntarily opened the hDDL website to check the superlative when they had questions about English. This suggests that these students are making progress from Stage 1 to Stage 2 on their own.

3.3 Release and Revision of hDDL

The DDL Project began in 2013 and for the first five years, we mostly used paper-based DDL. At that time, few schools had the technological infrastructure to support using DDL, so paper-based DDL was a practical choice. We first released eDDL in April 2019. We subsequently released hDDL in August 2019. Both hDDL and eDDL are available without cost or registration, so they can be accessed anytime by learners or teachers, and both were based on the pedagogical framework of SCoRE but with a unique corpus that matched the English level of the target learners. Additionally, we developed a corpus search tool to search this corpus. In this section, we describe the development of hDDL.

3.3.1 Development of Pedagogical Corpus

hDDL is equipped with its own pedagogical corpus. To create it, we developed a reference corpus that was collected from copyright-free language data, for example, a project called Tatoeba (<https://tatoeba.org/eng/>). We combined it with search software

and named it BES (Basic English Sentence) Search. This software allows users to set search criteria such as sentence length, grammatical item, lemma, part of speech, and/or phrase to search for English sentences suitable for learning objectives and the learners' level. Next, using BES Search as a reference corpus, a team of educators including an author of Japanese government-authorized English textbooks, Japanese English teachers, and native English teachers collaborated to create English sentences, one by one, and their Japanese translations, at the level of secondary school students. The hDDL corpus is a collection of these original sentences.

BES Search (<https://bessearch.ddl-study.org/>) was later released to the public as an introductory English sentence search software. It has approximately 1,337,000 copyright-free sentences (10,750,000 words). It uses English and Japanese as the language for instruction and for the manual. BES Search is a tool that helps teachers and material developers to create their teaching materials efficiently.

The characteristics of the hDDL pedagogical corpus created in this way are as follows.

- The corpus consists of complete English sentences (rather than partial concordance lines).
- All the sentences are copyright free. Teachers and students can download and use them freely.
- Sentence length, vocabulary, and grammar are level-appropriate.
- Instead of random topics as often found in newspapers and general corpora, we set up similarly-aged fictional characters with biographies including family members, pets, friends, teachers, subjects they are good at and bad at, hobbies, personalities, and so on to create a narrative in the English hDDL sentences. The characters were introduced with illustrations to promote familiarity with the sentences and to make them interesting.
- It is an English–Japanese parallel corpus.
- Pronunciations of all English sentences can be checked.

3.3.2 Development and Revision of Search Subtools

Since its release in August 2019, the hDDL search functions have been revised yearly. These are shown in Table 2. The hDDL corpus has also been expanded every year by increasing the size of the database.

Table 2. History of hDDL Development

Version	Release	Points of modification
1.00	August, 2019	Released the pattern browser search (search by selecting a grammar category)
1.10	September, 2020	Added a concordance search (search by entering a search expression)
1.20	August, 2021	Added an English quiz (sorting questions) Added English as the display language
1.30	October, 2022	Added Auto Search Added a DIY Search

The revision cycle is shown in Figure 2. First, the DDL tool was released, then implemented in schools. Once released, we asked cooperating schools to use the system and then asked students and teachers to comment on any difficulties they had in using hDDL or to suggest any functions they want to see in the next revision. In addition, one of the authors observed students using hDDL in classes. Based on the data collected, further revisions were made.

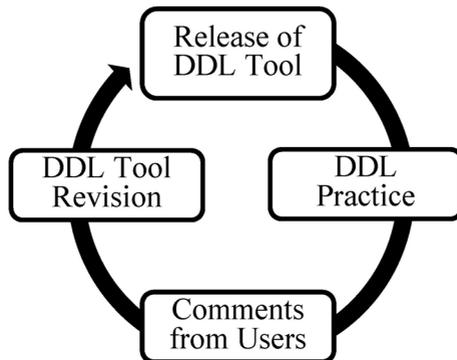


Figure 2. DDL Tool Revision Cycles

In the original release, hDDL included a pattern browser (Figure 3). This allowed students to click on the grammar item they wanted to learn. In Figure 3, the top left column shows the list of grammar items. The second left column shows subcategories of the chosen grammar item. The right column shows the extracted sentences. In this

case, students chose “past tense” on the left and chose “regular verbs” in the next column among the choices of “regular verbs,” “irregular verbs,” and “was, were.” In the right column, students can see English sentences and Japanese translations.

The screenshot shows the hDDL Pattern Browser Search interface. On the left, a sidebar lists various grammar items, with '過去形' (Past Tense) selected. The central area shows search filters, with '～しました ①' selected. The right pane displays search results for 'past tense', showing 10 items with English sentences and Japanese translations. The results are as follows:

Item ID	English Sentence	Japanese Translation
1	I wanted soup.	私は スープが 欲しかったです。
2	We watched birds.	私たちは 鳥を 観察しました。
3	Olivia walked away.	オリビアは 歩いて去りました (立ち去りました)。
4	I didn't cook yesterday.	私は 昨日 料理をしませんでした。
5	I studied English last night.	わたしは 昨夜 英語を 勉強しました。
6	Riko cooked curry on Sunday.	リコは 日曜日に カレーを 作りました。
7	They did not believe me.	彼らは 私を 信じませんでした。
8	Miho called me an hour ago.	三斗は 1時間前に 私に 電話をかけました。
9	The girl talked to the tree.	少女は 木に 話しかけました。
10	Daigo helped his father last Sunday.	ダイゴは この前の日曜日に 父親を 手伝いました。

Figure 3. Pattern Browser Search

Using this pattern browser was an easy way to do a search, but students could not search for grammatical items that were not on the list. In order to allow students to search freely and to experience the real pleasure of searching a corpus, we added a new concordance search function in version 1.10. In the top left column in Figure 4, students type in the word or phrase they want to search (e.g., *want*). From the next row, they choose the sentence length (e.g., between 3 and 8 words in the displayed sentences). They can also choose the number of sentences displayed on the screen from 3 to 20 or more. From the bottom left column, they can choose the grammar item to search. In this case, students chose infinitive sentences following *want*, *wants*, and *wanted* ([want*]). With this added function, students can look up English sentence examples for language issues they are curious about but that do not appear in the pattern browser list. However, this subtool requires students to input the search formula by themselves to extract the grammar items they wanted to explore.

Next, in version 1.20, we added English as an instructional language so that hDDL can be used by non-Japanese learners, and created an English quiz for students

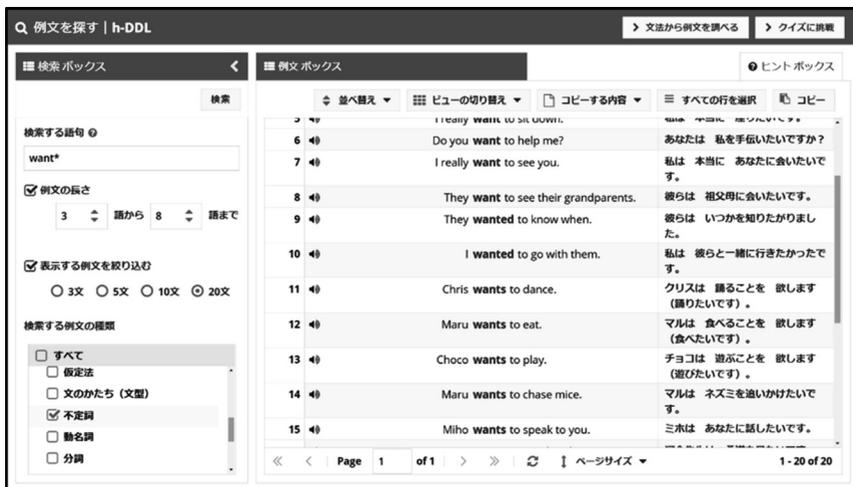


Figure 4. Concordance Search

to use to check their knowledge of grammar. This is done in the form of “rearrangement questions” in which students look at Japanese sentence construction and arrange the English words to match the Japanese. In the example shown in Figure 5, the student



Figure 5. English Quiz

has correctly ordered the first half of the sentence but has not yet done the second set of words. The quiz tool is easy to use and shows scores, so students can answer the questions as if they were doing a game. Best of all, because it uses sorting questions, students will pay attention to the structure of the English sentences.

3.3.3 Troubleshooting

The concordance search subtool added in 2020 (v. 1.10) to support the long-term goal of developing of autonomous corpus users created a problem—students had to type complex search formulas into their computer terminals. When we conducted a questionnaire on the use of hDDL among about 300 7th to 9th grade students and four English teachers who had focused on auxiliary verbs (in the 7th grade), gerunds (in the 8th grade), and present perfect (in the 9th grade), we received the following comments on the concordance search subtool (English translations of the original Japanese):

- I have a hard time using the DDL tool. I needed instructions from the teacher.
- I want the DDL tool to be a little easier to look up.
- I would like the DDL tool to be a little easier to search.

In addition, when one of the authors observed a class, she found that students had difficulty distinguishing between full-width and half-width characters, upper and lower case letters, the areas that require spaces and those that do not, and in using the keyboard.

4. Revisions to Foster Self-Directed Learners

To address this problem of the complicated input of search formulas, we made two revisions. First, “Auto Search” was added to display the concordance line with a single click. Although this subtool was convenient and much easier to use, it did not allow students to see or understand a search formula. Because this is a skill needed for independent corpus users, we added “DIY Search,” which allows students to create and/or customize a search formula—students can see and touch the search formula. These features are described in more detail in the next sections.

4.1 Auto Search

Each hDDL sentence has the information of a grammar item. For example, the

sentence *Life has changed* contains information on the identity (ID) of the grammatical item that indicates what it is, in this case [Perfect Forms–Perfective]. Auto Search combines the grammar item with a predefined search formula and displays sentences of a specific grammar item in the Key Word in Context (KWIC) concordance line. In other words, for [Perfect Forms–Perfective], the concordance lines are generated sentences that include this grammar item, with the past participle excluding “been” (expressed as [pos="VBN" & word!="been"] in the search formula of the corpus query language [hereafter CQL]) specified as the keyword. Auto Search is done in two steps with one click. Figure 6 shows an example. First, a student selects the grammar item to search from the top row “① Select a grammar item.” Then, in the lower section “② Choose a Search Pattern,” the subordinate grammatical items selected in ① will be displayed.



Figure 6. Auto Search

The grammar item or word the student wants to display is selected from here (Figure 6), and the KWIC concordance (Figure 7) will be displayed in the box to the right. The three dots give the option of going to the DIY Search.

When students previously entered search formulas, they sometimes could not gain search hits correctly because they included extra spaces or unintentionally used full-width alphabets. With Auto Search, only two clicks are needed to display the concordance lines (Figure 7). Thus, students can immediately work on observing and analyzing the example sentences. This reduces the amount of time spent on DDL

during class, allowing for more effective use of class time. Thus, with Auto Search, students can use the concordance search to analyze sentences even before they learn the rules of the search formula. They will be able to experience the pleasure of DDL using a corpus.

英	和
1 Life has changed .	人生が 変わってしまいました。
2 Summer has come .	夏が やって来ました。
3 Winter has ended .	冬は 終わってしまいました。
4 She has changed .	彼女は 変わってしまいました。
5 Fall has gone .	秋は 行ってしまいました。
6 The game has finished .	その試合は 終わったところです。
7 The test has started .	その試験は 始まったところです。
8 Baseball season has begun .	野球シーズンは 始まったところです。
9 Aki has done her best.	アキは 最善を つくしました。
10 Have you seen Gaku yet?	あなたは もう ガクに 会いましたか？
11 We have just finished dinner.	私たちは ちょうど 夕食を 済ましたところです。
12 It has already started snowing.	雪が もう 降り始めました。
13 They've already sold their house.	彼らは すでに 家を 売りました。
14 Aki's grandparents have already arrived .	アキの祖父は すでに 到着しました。
15 We haven't even begun yet.	私たちは まだ 始めてさえいません。
16 Has Miho left for school yet?	ミホは もう 学校へ 出かけましたか？
17 Ren has just cleaned his room.	レンは ちょうど 自分の部屋を そうじしたところです。
18 I have already done my homework.	私は すでに 宿題を しました。

Figure 7. An Example of the Result of a [Perfect Forms–Perfective] Concordance Search

4.2 DIY Search

Auto Search is a useful feature, but it does not allow students to see, create, or become familiar with the search formula. Therefore, in this modification, we added a DIY search function along with Auto Search. An important feature of the DIY search is the ability to paste the search condition criteria from Auto Search (grammar items and search formulas) into the DIY search screen (see the section marked with the rectangle at the top of Figure 8).

For example, if a student wants to search for sentences in the [Perfect Forms–Perfective], s/he would click the three dots [:] to the right of [Perfective] in Figure 6 (see the section with circle) and then click [Set as DIY Search] from its pull-down menu. The screen will then switch to the DIY Search. The search formula selected will be automatically pasted into the “Search for” window. (See the rectangle at the top of Figure 8.) At the same time, a checkmark will automatically be placed in the [Type of



Figure 8. DIY Search

Sentences to Search] box for the meaning of “Perfect Forms–Perfective.” (This is indicated by the second rectangular box.) From here, when the student clicks [Search], the same results as in the previous Auto Search will then be displayed.

Students can modify this search formula and change the type and range of example sentences to be searched. In this way, the search range can be widened or narrowed. By modifying an existing search formula, it is easier to understand the rules of the search formula than by creating a search formula from scratch. In addition, there is a tutorial called “Rules for Search Expressions.” By using this tutorial, students can learn the rules for CQL search expressions in a single step. In this way, the DIY Search allows students to hone their own corpus search skills.

5. Revisions and Improvements

As a result of these modifications, the hDDL concordance function has been improved in terms of both operability and search accuracy. In the previous concordance function, only surface forms could be specified as search terms for Auto Search. For example, when the conventional concordance function was used to search for comparative classes (*taller, other, better, closer*, etc.), erroneous KWIC words such as *player* and *her* were included in the search, as shown in Figure 9 (*He is the most popular player on the baseball team; Aki is taller than her mother*). The new concordance feature allows the original CQL search to be performed, making the search much more

accurate, and this type of noise contamination is minimized. Additionally, the previous concordance feature was limited to searching only comparative classes. However, with the new function, it is now possible to search for more than one adjective before a noun.

Since the release of version 1.30, we have not received any negative feedback about Auto Search from students who used hDDL for the first time. We have, however, received comments from secondary school students and teachers who have used hDDL for some time indicating that it became much easier to use.

例文	日本語訳
1 He is the most popular player on the baseball team.	彼は その野球チームの中で いちばん人気のある選手です。
2 Daigo is taller than all the other boys in his class.	ダイゴは クラスの中のどの男の子よりも 背が高いです。
3 Daigo is taller than all the other boys in his class.	ダイゴは クラスの中のどの男の子よりも 背が高いです。
4 Which dress is better , the blue one or the pink one?	どちらのワンピース（ドレス）のほうがいいですか、青いのですか、ピンクのですか？
5 Fukushima is larger than Niigata.	福島は 新潟よりも 広いです。
6 Is Tokyo smaller than Okinawa?	東京は 沖縄よりも （面積が）小さいですか？
7 Stay here a little longer .	ここに もうちょっと長く いてください。
8 Come a little closer .	もう少し近くに 来てください。
9 My hair is longer than Miho's.	私の髪は ミホのよりも 長いです。
10 Akito can run faster than Aki.	アキトは アキよりも 速く走ることができます。
11 Aki is taller than her mother.	アキは アキの母親よりも 背が高い。
12 Aki is taller than her mother.	アキは アキの母親よりも 背が高い。

Figure 9. Noise in the Search Results in the Previous Version

6. Conclusion

Since its inception, the DDL Project has inched forward in bringing DDL into elementary and secondary level EFL classrooms. Over the course of nearly a decade, we have created a simplified pedagogical corpus for the elementary level and another for the secondary school level along with corresponding search tools (eDDL and hDDL). Although COVID-19 created many challenges, one benefit has been that efforts to provide students with “one computer terminal per student” has meant many more

computers are now available in schools in Japan. Computer terminals have become as common and convenient for students as pencils and notebooks. With this change in the classrooms, eDDL and hDDL will become more accessible and may contribute to the goal of nurturing future autonomous corpus users. In order to achieve this goal, it is necessary for educators to develop and verify effective DDL instruction for this long-term plan.

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