# 「論文」

# Work Your Way through Authentic Data: Data-driven Construction Learning and Its Effectiveness Explored through an Experimental Study

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# Abstract

Corpora have been utilized for purposes of language pedagogy. One of the approaches, data-driven learning (DDL), uses corpora or corpus-based materials in language classrooms. DDL is an inductive language learning method in which learners explore authentic language data and discover linguistic patterns on their own. While empirical studies on DDL have been increasing (Boulton & Cobb, 2017), there are only a few experiments on "data-driven construction learning" (Gilquin, 2021). The present paper reports the results of an experiment aimed at testing the effectiveness of datadriven construction learning and evaluating learners' attitudes towards DDL. In the experiment, two groups of Japanese learners of English learned the way construction (e.g., Goldberg, 1995; Luzondo Oyón, 2013) with one group learning through DDL and the other through a traditional form-focused instruction. DDL in this study includes an explicit explanation of the target construction, following the tenet of applied construction grammar (Gilquin & De Knop, 2016). The effectiveness of the two methods was measured and compared by means of pre- and post-tests (sentence production and translation tasks). Additionally, the learners' attitudes towards DDL were investigated through a post-questionnaire. The improvement of both sentence production and translation tasks in the post-tests demonstrated that both DDL and the traditional instruction were effective. Also, the participants' attitude towards DDL was found to be positive. However, learners who received the traditional instruction outperformed those who received DDL. Therefore, the present study concludes that even though DDL was effective, other teaching methods could be more beneficial for learners, depending on the difficulty of a target construction and learners' proficiency. This paper also argues that learners can benefit from DDL in various ways, such as developing general cognitive skills, and hence it is suggested that incorporating DDL into a classroom activity or employing it as an out-of-class activity would be advantageous.

# 1. Introduction

Corpora have been extensively utilized in language pedagogy (cf. Leńko-Szymańska & Boulton, 2015). One of the approaches for foreign language learning based on corpora is data-driven learning (DDL). DDL uses corpora to facilitate foreign language learning, and this method allows learners to interact with authentic language data and discover linguistic patterns on their own (i.e., inductive language learning), using corpora or corpus-based materials. DDL can be categorized into two types according to the way corpora are used. The first type is computer-based or direct DDL in which learners have direct access to corpora. The second type is paper-based or indirect DDL in which learners use corpus-based materials and they do not have access to a corpus (see Yoon & Jo, 2014; Gilquin & Granger, 2022 for the clear distinction between direct and indirect use of corpora in DDL). Through DDL, learners can receive considerable amount of linguistic input by being exposed to a large number of authentic instances of a target lexical or grammatical item. DDL not only helps learners to become aware of linguistic patterns in their second language (L2) but also develops general cognitive skills for language learning (O' Sullivan, 2007, p. 277; Yoon & Jo, 2014, pp. 96-97). DDL has gained substantial attention and there have been a number of DDL studies since the approach was introduced by Johns (1991), one of the innovators of DDL. Meta-analyses have demonstrated that the effectiveness of the method was evident across multiple studies (Boulton & Cobb, 2017; Mizumoto & Chujo, 2015). The main focus of the application of DDL, however, has been on learning lexical and lexico-grammatical items, and "(larger) units such as constructions, by contrast, tend to be neglected" (Gilquin, 2021, p. 230) in DDL studies. Learning constructions (a construction is a conventionalized pairing of form and meaning as defined in construction grammar; e.g., Goldberg, 2006) through DDL is called "datadriven construction learning" (Gilquin, 2021). Specifically, to the best of my knowledge, there are no studies on data-driven construction learning targeting Japanese learners of English, other than Manabe (2024). Since empirical studies on data-driven construction learning have been rarely conducted, the present paper will focus on applying DDL to the learning of an abstract syntactic pattern by Japanese learners of English from a constructionist perspective. The aim of the present paper is to test the effectiveness of DDL in construction learning for Japanese learners of English by means of pre- and post-tests, and to also investigate learners' attitudes towards DDL via a post-questionnaire. In this experimental study, two groups of participants learned the *way* construction (e.g., Frank dug his way out of the prison; Goldberg, 1995, p. 199; see also Luzondo Oyón, 2013). Learning the *way* construction can benefit learners of English, as it facilitates both reading comprehension and natural expression of progress or movement in communication<sup>1</sup>. One of them learned the target construction through DDL, and the other learned through traditional form-focused instruction. The three main research questions are addressed in the current study:

- 1. Can Japanese learners of English effectively learn the *way* construction through DDL?
- 2. Is DDL equally or more effective in construction learning compared to a traditional form-focused instruction?
- 3. Do Japanese learners of English show positive attitudes towards DDL?

The structure of this paper is as follows. Section 2 introduces the theoretical background, i.e., construction grammar, and "data-driven construction learning" (Gilquin, 2021, p. 231) which applies DDL from the constructionist perspective. In Section 3, the experiment conducted at a national university in the Chubu region of Japan and the data analysis methods are described. In Section 4, the results of the preand post-tests and the evaluation of DDL are presented. Finally, Section 5 argues that, despite the fact that the traditional instruction group outperformed the DDL group, DDL has great potential for improving linguistic knowledge and other cognitive skills.

# 2. DDL and Construction Learning

### 2.1 Construction Grammar

A construction in construction grammar (e.g., Goldberg, 2006; Hilpert, 2019; Hoffmann, 2022; Hoffmann & Trousdale, 2013) is a basic linguistic unit that has a form-meaning pair. Any level of linguistic item (e.g., morphemes, words, idioms, argument structure constructions) is seen as a construction if they contain a conventionalized pairing of form and function (Goldberg, 2006, p. 3). Linguistic knowledge in

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speakers' minds forms a large network of constructions (Hilpert, 2019, p. 2). A usagebased framework claims that the constructional network is built through generalizing a huge amount of linguistic input (Gilquin, 2021, p.231). Usage-based theories suggest that language is acquired through actual language use, and therefore linguistic input and frequency are regarded as a crucial factor for language acquisition (Hoffmann, 2022, p. 27). From a usage-based perspective, DDL that can provide a considerable amount of authentic input is expected to be effective.

In applied construction grammar (Gilquin & De Knop, 2016), it is considered what speakers learn when acquiring a foreign language is constructions (Gilquin, 2016, p. 146). Thus, L2 learners acquire constructions of a target language during L2 acquisition. The acquisition of a first language (L1) and L2 is different in several ways, and the differences are attributable to learning environments, amount of input, authenticity of input, learning process (inductive/implicit vs. deductive/explicit), and so forth (Gilquin,2021, pp. 231-232). However, by adopting DDL, learners can be exposed to a substantial amount of authentic input and inductively learn target constructions. Consequently, it is possible that DDL brings the process of L2 learning closer to that of L1 acquisition (Gilquin, 2021, p.231).

## 2.2 Data-driven construction learning

Gilquin (2021) applied DDL to learning constructions from the perspective of usage-based construction grammar, and called this approach "data-driven construction learning" (p. 231). In data-driven construction learning, the focus is primarily on an abstract syntactic pattern. In the experiments of Gilquin (2021), high-intermediate learners of English studied three constructions (i.e., the MAKE causative construction, the *way* construction, and the *into* causative construction). As a result of pre- and posttests, the participants demonstrated a strong understanding of the target constructions. After DDL, an increase in the number of produced sentences and an improvement in the quality of the sentences (native-like quality) were observed. Additionally, the use of "new verbs" (Gilquin, 2021, p 238), whose cooccurrence with the target constructions was not introduced in the DDL material, was found in the produced sentences of the *way* construction and the *into* causative construction. This suggests that DDL led learners to generalization of knowledge of the *way* constructions by Japanese learners of

English in Manabe's (2024, p. 23) experiment. However, Gilquin (2021) also pointed out some downsides of DDL such as the lack of long-lasting effect and the time-consuming nature of the method (p. 242). Similarly, several previous studies have highlighted both the same and other weaknesses of DDL (e.g., Chambers, 2022, p. 420; Boulton, 2010, pp. 535-537; Gilquin & Granger, 2022, p.436). As for the evaluation of DDL, it was reported that both positive and negative attitudes towards DDL were observed and it was pointed out that DDL was not favored by some learners (Gilquin, 2021, p. 241). Manabe (2024, p. 24) reported Japanese learners' positive attitudes towards DDL were evident in a number of previous studies (e.g., Boulton, 2010, p. 557; Gilquin & Granger, 2022, p.436; Mizumoto & Chujo, 2015, p. 12; Takahashi & Fujiwara, 2016, p. 95).

# 3. The Experiment

### 3.1 Experimental design

The experiment was composed of pre- and post-tests, a pre- and postquestionnaire, and the educational intervention. The experiment started with the prequestionnaire (about five minutes) followed by the pre-tests (16 minutes). After a 10-minute break, the participants received the educational intervention for 30 minutes, which was followed by another 10-minute break. Then the participants took the posttests (10 minutes) and completed the post-questionnaire (no time limit).

### **3.2 Participants**

The participants were L1 Japanese speakers at a national university in the Chubu region of Japan, who were learning English as a foreign language. Forty students (37 undergraduates and three graduates) took part in the experiment (M age = 20.4 years, SD = 1.96; M years of English language learning experience = 9.8 years, SD = 3.15). Due to the random sampling procedure, participants' proficiency levels varied considerably, ranging from A2 to C1 on the CEFR scale, with B1 being the most frequent level<sup>2</sup>. The participants were divided into two groups: the DDL group and the traditional instruction (TI) group.

### 3.3 Educational interventions

The participants learned the *way* construction (e.g., Goldberg, 1995; Luzondo Oyón, 2013) using a concordance and a worksheet (henceforth, the DDL material) created by the author (see Appendix 1 and Appendix 2). The concordance consisted of twenty instances of the *way* construction extracted from the Corpus of Contemporary American English (COCA: Davis, 2008-). The author selected sentences that seemed relatively easy for learners to understand, based on vocabulary (e.g., the absence or presence of technical terms) and the length of the sentences.

The DDL group received a paper-based DDL. DDL in this study includes an explicit explanation of the central form and meaning of the target construction. I will refer to this DDL approach as construction-centered DDL. A pilot study<sup>3</sup> and a previous study (Manabe, 2024) showed that the *way* construction is a difficult construction for Japanese learners of English. Hence, construction-centered DDL was developed because it was expected that an explicit explanation of the construction would facilitate learners' understanding of the way construction (see Sung & Yang, 2016 for the effects of construction-centered instruction). In the DDL intervention, the author first briefly explained DDL and how to interpret the concordance prior to students' independent learning of the target construction. The participants were asked to read example sentences in the concordance and work on the worksheet. The tasks on the worksheet included translating into Japanese, paraphrasing, and describing forms and meanings that learners discovered (see Appendix 2). To eliminate the possibility that other factors would influence learning outcomes, there was neither teacher intervention nor interaction among the participants. The participants were permitted to use a dictionary to look up words within the concordance. However, searching for the way construction was prohibited. After the DDL intervention, the DDL material was collected.

In the TI group, the participants learned the *way* construction in a more traditional way. The instruction was a teacher-centered lecture, mainly focusing on the form of the target construction. In the first task, namely a syntactic task, the participants categorized six sentences, which have the term "way," into three groups based on their forms. Then they were provided with an explanation of the *way* construction with Japanese translations and a few examples. After going through the explanation of the *way* construction, the participants completed three types of exercises: True or False, Sentence Scramble, Fill-in-the-blank. Finally, they had some time (up to five minutes) to

individually review what they learned. The sentences in the TI material were also based on corpus data in order to ensure that participants would not receive any inappropriate input. The overall contents of each instruction are shown in Table 1.

DDL (30 minutes)	TI (30 minutes)
Introduction	Introduction
(An explanation of DDL and the concordance)	(Syntactic task)
	Form-centered explanation
ומס	(Japanese translations and examples)
DDL (The concordence with an explicit explanation	Exercise
(The concordance with an explicit explanation	(True or False, Sentence Scramble,
about the <i>way</i> construction, and the worksheet)	Fill-in-the-blank)
	Review
Collection of the material	Collection of the material

Table 1. The overall contents of each instruction

# 3.4 Pre- and post-tests

The pre-tests consisted of three types of tests: a vocabulary size test (VST; Hamada et al., 2021)<sup>4</sup>, a sentence production task (SPT), and a translation task (TT). This study utilized the VST to examine participants' prior knowledge of English. In the SPT, the participants were asked to generate as many sentences as possible containing the *way* construction within five minutes. Since the *way* construction was considered a highly difficult construction and the term "the *way* construction" is not well-known, it is assumed that producing sentences using this construction had become unnecessarily difficult (Manabe, 2024, p. 22). Therefore, the form of the *way* construction (subject + verb + one's way + preposition/adverb) and two example sentences (i.e., "He made his way through the crowd" and "The kid crawled his way into the room") were provided in the SPT in the pre-tests. In the post-tests, the form and the example sentences of the *way* construction were removed. The TT was conducted to investigate whether participants understood the meaning of the target construction into Japanese within five minutes. The questions were generated by the author based on corpus data (see

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Appendix 3). The TT in the pre- and post-tests are essentially identical, differing only in a few modified elements (e.g., subjects and possessive pronoun). For example, one paired question about "make one's way through" in the TT was "She made her way through the forest" in the pre-tests and "He made his way through the crowd" in the post-tests.

### 3.5 Pre- and post-questionnaires

The pre-questionnaire collected information about speaker attributes (e.g., age and proficiency). In the post-questionnaire, a Likert scale (5-point) and open-ended questions were included to investigate learners' attitudes towards DDL.

### 3.6 Analysis

The results of the SPT were analyzed based on correct and incorrect usage of the way construction. The correct and incorrect usage discussed in this paper evaluated the way construction, and other errors were not taken into consideration (e.g., errors in inflections). The analysis of the produced sentences was carried out in the following steps: (1) the verification of form and meaning, (2) a corpus-based confirmation, and (3) an appropriateness judgment by L1 English speakers. In Step 1, the form of the produced sentences was checked, and sentences that did not follow the "verb + one's way + preposition/adverb" structure were classified as incorrect usage. Sentences that conformed to the form of the way construction but did not have the semantics of the way construction were also classified as incorrect usage (e.g., "I will go my way to achieve my goal"). As the next step, the sentences remaining from Step 1 were searched in COCA. If an expression was found in COCA, the sentence was classified as correct usage. Finally, the sentences remaining from Step 2, totaling 119 sentences, were judged by four L1 English speakers<sup>5</sup>. The appropriateness was evaluated using a 4-point Likert scale, and sentences that received an average rating of 3 or higher were classified as correct usage. The answers of the TT were evaluated by two L1 Japanese speakers<sup>6</sup> (including the author), and only the answers that received consistent evaluations from both raters were classified as correct answers

# 4. Results

### 4.1 Tests

The sentences produced in the pre- and post-tests, with a total of 298 sentences, were analyzed. All the statistical analyses were performed using R (R Core Team, 2024). The number of correct and incorrect sentences is shown in Table 2, and the proportion of them is illustrated in Figures 1 and 2.

The Shapiro-Wilk test was utilized to test the normality of the data, and its results are shown in Table 3. The results showed that only the TI's SPT score in the post-test followed a normal distribution. Since all the other scores showed non-normal distributions, non-parametric tests were deemed appropriate for the statistical analyses in the present study.

	DDL	group	TI group				
	correct	incorrect	correct	incorrect			
Pre-test	4	42	6	37			
Post-test	50	38	103	18			

Table 2. The number of correct and incorrect sentences in the SPT in the pre/posttests



Figure 1. The proportion of correct and incorrect sentences in the SPT of the DDL group

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Figure 2. The proportion of correct and incorrect sentences in the SPT of the TI group

First of all, it is worth noting that the participants in the two groups were at almost the same levels in terms of vocabulary and knowledge of the target construction. No significant difference was found between the DDL group and the TI group in the VST by the Mann-Whitney U-test (W = 209.5, p=0.8012, effect size r = 0.0406). Therefore, the participants in the two groups were likely at almost the equal levels of English proficiency in terms of vocabulary. Also, the Mann-Whitney U-test indicated that there was no significant difference between the DDL group and the TI group in both the pre-test SPT (W =180, p = 0.4820, effect size r = 0.0855) and the pre-test TT (W = 216, p = 0.6546, effect size r = 0.0684). Hence, the participants in the two groups

		١	N	p-va	ilue
		DDL	TI	DDL	TI
Pre-test	VST	0.8526	0.8554	0.0059	0.0066
	SPT	0.4954	0.5804	< 0.001	< 0.001
	TT	0.7869	0.8100	< 0.001	0.0012
Post-test	SPT	0.9011	0.9572	0.0433	0.4902
	TT	0.8620	0.8496	0.0085	0.0052

Table 3. The results of the Shapiro-Wilk tests

appeared to have almost the same prior knowledge about the way construction.

According to the results of the pre- and post-tests, DDL was effective in learning the *way* construction. As for the SPT of the DDL group, the results of the Wilcoxon signed-rank sum test indicated a significant difference between the pre- and post-test (V = 3, p < 0.001, effect size r = 0.8515). The results of the TT of the DDL group also showed a significant difference between the pre-test and post-test by the Wilcoxon signed-rank sum test (V = 0, p = 0.0013, effect size r = 0.8765). In addition, as shown in Table 4, the eighteen participants (90% of the total) in the DDL group produced more correct sentences in the post-test than in the pre-test. However, there were two participants who did not improve in producing the target construction after DDL. These results suggest that the DDL intervention was effective to some extent, and almost all of the participants effectively learned the *way* construction through DDL.

Regarding the TI, the effectiveness of the instruction was confirmed. The results of the SPT of the TI group indicated a significant difference between the pre- and posttest by the Wilcoxon signed-rank sum test (V = 0, p < .001, effect size r = 0.8763). The results of the TT also showed a significant difference between the pre- and posttest by the Wilcoxon signed-rank sum test (V = 0, p < .001, effect size r = 0.8765). Additionally, all the participants in the group showed an increase in the number of correct sentences in the post-test SPT (see Table 5). As the results illustrate, the traditional form-centered lecture was also effective for learning the *way* construction.

To see whether there was a difference in effectiveness of the two teaching methods, the results of the post-tests (both the SPT and TT) were compared with the Mann-Whitney U-test. The results of the SPT showed that there was a significant difference between the DDL group and the TI group (W = 64, p < 0.001, effect size r = 0.5817).

Table 4. The number of correct sentences in the pre/post-test for each participant in the DDL group

										Р	artici	pant	ID							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Pre	1	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Post	5	5	5	2	5	2	2	2	1	0	1	0	3	3	2	2	4	1	1	4

Pre = the pre-test, Post = the post-test

									Р	artici	pant ]	D								
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Pre	0	0	0	1	0	0	1	0	0	0	0	1	0	0	0	1	0	1	1	0
Post	4	6	4	8	3	5	3	9	1	4	6	4	4	4	6	6	7	5	8	6

Table 5. The number of correct sentences in the pre/post-test for each participant in the TI group

Pre = the pre-test, Post = the post-test

Table 6. The difference of the proportion of correct answers in the TT in the post-tests

Evenessions	וחס	TT	Difference
Expressions	DDL	11	(TI - DDL)
make one's way through	65%	95%	30%
find one's way to	20%	100%	80%
elbow one's way through	65%	70%	5%
talk one's way out of	15%	55%	40%
work one's way through	30%	85%	55%

The results of the TT also indicated a significant difference between the two groups (W =38, p < 0.001, effect size r = 0.6929). Furthermore, an analysis of the accuracy rates for the two groups in the post-test TT indicated that the TI group outperformed the DDL group on all five questions (see Table 6). Focusing on the accuracy rates of each question in the pre- and post-tests, an increase in accuracy rates for all five questions was observed in both the DDL group and the TI group (see Figures 3 and 4). For all five questions, the improvement in accuracy rates (subtracting the pre-test scores from the post-test scores) was greater in the TI group than in the DDL group. For example, the increase in the accuracy rate for "make one's way through" is 15 % in the DDL group. These results suggest that the TI was more effective than DDL in this experiment, and the participants in the TI group were able to learn the *way* construction more effectively.



Figure 3. The accuracy rates for each expression in the TT in the pre/posttests in the DDL group



Figure 4. The accuracy rates for each expression in the TT in the pre/posttests in the TI group

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# 4.2 Evaluation of DDL

The post-questionnaire investigated how learners who experienced DDL perceived the approach. Figure 5 presents the questions measured on a 5-point Likert scale<sup>7</sup>. All the questions for which the sum of "agree" and "strongly agree" is 75% or more are related to positive opinions. There are some participants who felt that DDL and the tasks were difficult. However, there were hardly any negative opinions towards DDL. The participants tended to have positive attitudes towards DDL in the present study.



Figure 5. The results of the post-questionnaire in descending order based on the sum of "agree" and "strongly agree" (N=20)

In the open-ended questions, the participants were asked to describe the "positive aspects of DDL" and "aspects they disliked about DDL." In the descriptions of the positive aspects, the participants mentioned the amount of examples, proactive learning, discovery, and so forth (Examples 1 and 2). In the responses regarding the aspects that participants did not like, worries about their understanding of the target construction (Examples 3 and 4) and the the lack of teacher intervention (Example 5), and so forth, were identified.

- (1) The amount of example sentences was enough to understand the grammar.
- (2) Since I discover the features myself, I can learn proactively.

- (3) I was concerned that if my understanding was wrong, I might have learned it incorrectly.
- (4) I get anxious about whether the similarities I discovered are actually correct.
- (5) Since there was no explanation from the teacher, I didn't know if what I was thinking was accurate.

## 5. Discussion

The present study illustrated that construction-centered DDL was effective in learning an abstract construction. The effectiveness of the method was measured by a comparison between the pre- and post-tests. As the analysis in Section 4.1 revealed, both the DDL group and the TI group showed an increase in correct sentences and in accuracy rates in the post-tests. The results indicate that DDL and the TI are effective, and that learners are able to capture the central form and meaning of the target construction through both methods. It can be concluded that construction-centered DDL has a positive impact on the learning of a construction. Thus the first research question, regarding the effectiveness of DDL, is framed positively.

While DDL conducted in this study was found to be effective, the TI was more effective in helping the participants learn the *way* construction. The comparison between the two groups showed that the TI group demonstrated a greater improvement in both SPT and TT in the post-test than the DDL group. While 18 participants (90% of the total) in the DDL group produced more correct sentences in the post-test than in the pre-test, all the participants in the TI group showed an increase in correct sentences. Also, the TI group illustrated higher scores in all five questions of the post-test TT than the DDL group. However, given the fact that Japanese translations were provided during the TI but not in DDL, this is not surprising. As the aforementioned results suggest, learners who receive the TI for learning the *way* construction more effectively than those who learn it through DDL. Hence, the analysis points to a negative response to the second research question regarding a comparison between DDL and the TI, because even though DDL was effective, the TI group outperformed the DDL group in both the SPT and TT.

One possible reason the TI group outperformed the DDL group may be

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attributable to the difficulty of the target construction. In total, there were only 10 (out of 89) correct sentences produced by the participants in the SPT in the pre-tests. Three sentences (about 33%) of the correct sentences in the pre-tests were imitations of the example sentences provided in the pre-tests, with only minor modifications, such as changes in the subject and possessive pronoun. For example, one of the produced sentences was "She made her way through the crowd," whereas one of the example sentences was "He made his way through the crowd". Only 10 out of 40 participants were able to produce a correct sentence with the way construction in the pre-tests. In addition, the TT in the pre-tests also indicated weak performance. The average accuracy rate of the TT for the DDL group was 18%, while that for the TI group was 16% (both groups answering five questions with 20 participants each). Taking these results into account, it is concluded that the way construction is a highly difficult construction for Japanese learners of English (possibly for learners of English with different L1s as well). Since the way construction is a difficult construction for Japanese learners of English, the participants in the DDL group might have struggled to understand the construction, produce them in their own words, and generalize what they learned through the input in the DDL material. This can explain why the two participants in the DDL group did not improve in sentence production (see Section 4.1). If this is the case, then there is a great possibility that the difficulty of a target construction will have a great impact on the effectiveness of DDL. Another explanation for the somewhat unfavorable results of the DDL group is that the explicit explanation of the target construction might have confused the participants. There might be a need to refine the explicit explanation, minimizing linguistic terms and making it comprehensible for any learners. To determine whether these are true, further empirical studies are required considering different levels of constructions as a learning target in DDL.

In addition to the difficulty of a target construction, learners' proficiency level should be taken into consideration. The present study did not include proficiency level in the analysis. Future studies should include learners' proficiency because it can also be a strong factor that affects outcomes of DDL. For advanced learners, simple exposure to input may be sufficient to learn a construction, as they are likely to have a sensitivity to discerning linguistic patterns. That is to say, advanced learners are able to extract patterns and generalize them by themselves. Lower-level learners, on the other hand, may not be sensitive enough to discern linguistic patterns, and hence have diffi-

culties learning a target construction without assistance such as an explicit instruction.

As for the evaluation of DDL, it was found that the participants tended to have positive attitudes towards DDL, as the results of the post-questionnaire illustrated. Hence, the answer to the third research question is affirmative. Learners' positive attitudes towards a teaching/learning method are likely to contribute to positive outcomes (Gilquin, 2021, p. 239). As some participants mentioned (see Section 4.2), the considerable amount of instances were favored, and this is probably because grammar instruction usually includes fewer example sentences for the learning items. The more advanced learners are, the more likely they are to prefer autonomous learning, i.e., DDL, as they are capable of processing a large amount of input on their own. Some participants found DDL to be challenging, and this could be because they were not used to receiving a considerable amount of input in a short period. Also, some of the participants felt anxious while doing DDL because they did not know the answers to the questions in the worksheet or they sometimes did not comprehend some of the instances in the concordance. DDL as a classroom activity can involve teacher intervention and interaction among students, which will scaffold students' understanding of a target construction and reduce their anxiety. Accordingly, DDL may be more positively evaluated by a larger number of students.

Even though the DDL group did not perform as well as the TI group in the present study, the DDL group succeeded in capturing the target construction to some extent and the effectiveness of DDL was confirmed. Furthermore, it has been claimed that DDL can promote generalization of constructional knowledge that learners learn through DDL (Gilquin, 2021; Manabe, 2024), as shown in Section 2.2. This suggests that DDL is effective not only for rote memorization but also for the generalization of linguistic knowledge. In addition, previous studies claimed that DDL can develop general cognitive abilities, including "predicting, observing, noticing, thinking, reasoning, analysing, interpreting, reflecting, exploring, making inferences (inductively or deductively), focusing, guessing, comparing, differentiating, theorising, hypothesising, and verifying" as listed by O' Sullivan (2007, p. 277). These skills "may also be transferred to other fields of study" (Gilquin & Granger, 2022, p. 431). Another useful application of DDL is error correction (Gilquin & Granger, 2022, p. 430). Through DDL in a classroom, learners can become familiar with corpus consultation and eventually they will be able to autonomously utilize corpora whenever needed, such as for

academic writing. The implementation of DDL is beneficial for learners in terms of developing such skills. DDL is therefore a method with great potential to help learners of a foreign language advance in terms of linguistic knowledge and various other skills. Moreover, the effectiveness of DDL can be fostered by combining it with other teaching methods (Gilquin, 2021, p. 243). Incorporating DDL into classroom activities can help learners acquire a target construction and get used to its authentic usage. Also, DDL can be carried out outside of the classroom. For example, learners can work on DDL materials as homework, and then discuss their discoveries in pairs or groups in the classroom. Teachers can scaffold their understanding by asking questions and having them complete extra projects during the class. DDL is originally designed for autonomous learning, having learners independently explore linguistic data. Hence, it is also suitable as an out-of-class activity. This may make it easier for teachers to adopt DDL in their classes.

# 6. Conclusion

This study demonstrated the effectiveness and potential of data-driven construction learning as well as possible refinements to the method. Several limitations of this study were also pointed out, such as the excessive difficulty of the target construction, the exclusion of proficiency levels in the analysis, and heterogeneity in proficiency levels (see Section 3.2). In future empirical studies, proficiency levels and different levels of constructions as learning targets must be taken into account to determine whether these factors have a significant impact on the effectiveness of DDL. Additionally, ways to incorporate DDL into an actual classroom must be explored. For example, integrating generative AI into DDL is one possible future direction (see Crosthwaite & Baisa, 2023; Mizumoto, 2023 for the synergy between AI and DDL). I hope this study will contribute to future research on DDL and its dissemination in educational settings.

## Footnotes

- 1. Iida (2021, p. 112) pointed out that the *way* construction warrants pedagogical attention, as it appears in high school English, such as in university entrance examinations and some textbooks.
- 2. The participants' English proficiency levels were determined based on English

proficiency tests (e.g., TOEIC and IELTS), which were converted to CEFR (Ministry of Education, Culture, Sports, Science and Technology, 2015). The distribution was as follows: 1 participant at A2 (2.5%), 19 participants at B1 (47.5%), 10 participants at B2 (25%), and 2 participants at C1 (5%). Among the total participants, proficiency data were unavailable for 8 participants (20%) who had not submitted their test scores.

- 3. The pilot study was conducted with six participants (three undergraduates and three graduates) in January and February 2024. Only one participant was able to produce correct sentences with the *way* construction in the pre-test sentence production task.
- 4. Levels 1 to 3 (60 items) of the VST (Hamada et al., 2021) were used.
- 5. The four L1 English speakers were three Americans and one Australian.
- 6. Two L1 Japanese speakers (including the author), who have knowledge of the *way* construction, evaluated the answers of the translation task.
- 7. The original questionnaire and responses to open-ended questions by the participants were in Japanese but they were translated into English by the author without changing the meaning.

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Appendix 1. The DDL material (the concordance)

Way 構文の説明と例文 1~20 を読み、ワークシート(別紙)を行ってください。

#### Way 構文

形:「主語+動詞+one's way+前置詞句/副詞」

意味:「動詞の表す行為をすることでできた経路を通り、前置詞句/副詞で示す方向へ 主語が移動する(移動には困難や障害を伴うことが多い)。」

1	The officers made their way through the kitchen and into the lobby.
2	Unlucky for me, it seems that a mosquito found its way into my bedroom.
3	Perhaps he could still manage to talk his way out of this increasingly dangerous situation.
4	He rudely elbowed his way through the crowd toward her.
5	She is a frequent keynote speaker and radio show guest whose profound teachings have
	helped many find their way through the difficult times of life.
6	Jimmy will find his way through the dark forest.
7	The poem found its way into the pages of Punch magazine.
8	What is clear is that remarkably little of the agency's money finds its way to the people who
	need it.
9	He kept his hat on as he made his way across the living room and into the kitchen.
10	After eating breakfast, he made his way through the snow down the hill to where someone
	had a phone working and he called and had someone come plow us out.
11	Instead, she graduated, grabbed her tiny savings, and made her way to Nepal.
12	On Wednesday nights he drags the projector out of his office and sets it up in the art room
	and they watch Godzilla making his way toward Tokyo.
13	Instead, he decided to go to law school and worked his way through Yale Law School.
14	He worked his way through the crowd, toward the door.
15	We have to <b>work our way out of</b> this mess.
16	To work your way into a new community, where you're not very well known, you've got to
	be there at least 10 years and build all those relationships.
17	As she left him behind and worked her way to the opposite end of the crowd, she tried not
	to think about what the doctor had said.
18	The man left my side and, using his stick for aid, <b>pushed his way to</b> the front of the crowd.
19	He said he woke up smelling smoke and had to <b>fight his way out of</b> the burning building.
20	Several news crews fight their way through the crowd.
·	

ワークシート
前:
文(別紙)を見て、以下のタスクを行なってください。
例文1と2を日本語に訳してください。
例文1
例文2
例文3を読み、次の文を英語で言い換えてください。 Us islad his you get of difficult situations
ne jokeu nis way out of difficult situations.
例文4を英語で言い換えてください。
例文4
way 構文の形(品詞、動詞の種類など)について気づいたことを説明してください。
例文を通して way 構文の意味についてどんなことがわかりましたか。動詞の意味に注 目して way 構文の意味を説明してください。
way 構文について、他に気づいたことを記入してください。

Appendix 2. The DDL material (the worksheet)

Appendix 3. The translation tasks in the pre- and post-test (Due to space limitations, the answer sections were omitted)



問. 以下の文を日本語訳してください。

- (a) She made her way through the forest.
- (b) They found their way to New York.
- (c) My friend elbowed her way through the crowd.
- (d) My sister talked her way out of the difficult situation.
- (e) The student worked his way through high school.

## 事後テスト (the post-test)

- 問. 以下の文を日本語訳してください。
- (a) He made his way through the crowd.
- (b) She found her way to Tokyo.
- (c) My brother elbowed his way through the crowd.
- (d) I was able to talk my way out of the situation.
- (e) My friend worked her way through university.