

# Computerized Dynamic Assessment of Dictionary Use Ability

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## Abstract

This paper demonstrates a new web-based dictionary training resource, named the Computerized Dynamic Assessment of Dictionary use Ability (C-DADA) intended for Japanese learners of English. C-DADA is a computerized format of dynamic assessment (DA), which originated in the works of Vygotsky, and is developed for lexicographic purposes. The fundamental aspect of DA is the integration of assessment and instruction. In addition, DA distinguishes two levels of ability: actual and potential. The former is the level at which the individual can perform by himself, while the latter is the level at which he can solve a problem with others' assistance. Likewise, C-DADA is designed to assess the learners' actual and potential levels of receptive dictionary use ability through providing feedback according to individual learners' responsiveness, and so further promote their dictionary use ability. The paper first introduces the theoretical and methodological framework of DA, and then discusses the design and mechanics of C-DADA. Lastly, it gives a general overview of an on-going lexicographic project to examine the effectiveness of C-DADA.

**Keywords:** dictionary use, dictionary training, dynamic assessment, computerized dynamic assessment

## 1 Introduction

The need for dictionary training has long been advocated by many, such as lexicographers, applied linguists, curriculum designers and language teachers. To meet the demand, the author has developed a web-based dictionary training resource, named Computerized Dynamic Assessment of Dictionary use Ability (C-DADA). To better understand C-DADA, its theoretical and methodological framework will first be presented.

### 1.1 Dynamic Assessment (DA)

Dynamic assessment (DA) is an assessment method based on the sociocultural theory of mind, originating with Vygotsky, a Russian developmental psychologist. The fundamental idea of this theory is that social interaction is responsible for the development of higher mental functioning (Vygotsky 1978). DA is especially grounded in the concept of the zone of proximal development (ZPD). ZPD is "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky 1978, p. 86). It is also the place where learning will take place. The purpose of DA is to determine how much learning can take place in the ZPD during the task or test with or without others' assistance or mediation, while at the same time promoting this development as effectively as possible. Unlike traditional psychometric tests, in which there is no direct interaction between an assessor and learners during administration, in DA the assessor attempts to share the problems with the learners, to find out their actual level of performance on the task and to enhance their level of performance to overcome the problems they face (Reza & Barabadi 2012). In addition, it is possible for the assessor to track a learner's development during and across sessions. The assessor in DA is not a complete observer who maintains distance from the learner, but

rather a facilitator and mediator of learning. In this regard, the DA assessor and the learners are both active participants. The DA assessor interacts with the learners, helps them learn by giving feedback, clues, or mediational prompts as needed, and thus they collaboratively achieve the task. In this way, assessment and learning are seen inextricably mingled and not as separate processes (Reza & Barabadi 2012).

## **1.2 Computerized Dynamic Assessment**

DA first appeared in the field of developmental psychology to examine the learning potential of people or the developmental stages of children's cognition (e.g., Sternberg 2014; Sternberg & Grigorenko 2002). In the past two decades, it has been applied to educational contexts as a promising approach to build more effective learning environments. However, it has not been widely used in classroom settings. This is possibly because the administration of DA tends to be time consuming. In DA the assessor is required to pay careful attention to changes regarding the types of problems learners encounter, provide the appropriate assistance they require to overcome the problems with adjustment in their ZPD, and observe their responses to such assistance. In this respect, the generalizability of outcomes of DA is said to be very difficult. Other problems are related to a lack of adequate knowledge base and expertise in this field (Reza & Barabadi 2012), which may be more serious problems with regard to bringing DA into wider use. However, researchers have found a practical solution to address these matters by using state-of-the-art technology, by adapting DA into a computerized format, called Computerized-Dynamic Assessment (C-DA). Indeed, over the last decade, applications of C-DA have been increasing in foreign language education (e.g. Ebadi & Saeedian 2016; Poehner & Lantolf 2013).

## **2 Computerized Dynamic Assessment of Dictionary Use Ability (C-DADA)**

The Computerized Dynamic Assessment of Dictionary use Ability (C-DADA) is designed to blend assessment, instruction, and training of receptive dictionary use in one holistic activity. To do this, C-DADA gives the task to the learners with providing feedback to help solve a problem that they face while they are working on. The type, level and frequency of feedback are further used for numerically evaluating their dictionary use ability.

### **2.1 Task and Feedback on C-DADA**

To the best of the author's knowledge, DA has not been discussed in the lexicographic literature to date. Accordingly, C-DA, a derivative of DA, has not been developed and studied either. However, C-DA is technically applicable and very beneficial, especially in pedagogical lexicography, in which L2 learners' lack of dictionary use skills and the necessity of dictionary instruction have long been noted (e.g., Chan 2012; Nesi & Hail 2002; Wingate 2004). If C-DA for dictionary use is available, it may enable teachers to manage to instruct and evaluate learners' dictionary use skills without needing much time for both. In addition, like other e-learning resources, this type of C-DA use may establish an environment where learners study dictionary use by themselves outside the classrooms. It may further enable teachers to easily track and record their achievement and progress in the digital format. However, the most significant aspect is that the application of C-DA may maximize the learning potential of dictionary use rather than its practicality, as DA does. Based on these assumptions, the author presents a newly developed C-DA as a lexicographic resource, named the Computerized Dynamic Assessment of Dictionary use Ability (C-DADA).

Following the principles of DA, C-DADA is designed to unify assessing and instructing dictionary use skills in a single task. More specifically, C-DADA assesses how learners' actual and potential

levels of receptive dictionary use ability while learning could be promoted as much as possible. It should be noted, however, that because the target user of C-DADA is a learner of English at a beginning or lower intermediate level, the task on C-DADA focuses on some core skills necessary to search the contextual meaning of a word in the dictionary rather than comprehensive skills for receptive use of a dictionary. The next is the steps that a learner takes in C-DADA.

First, the learner is shown a short sentence which includes a bold, italicized word as the targeted word, the meaning of which is to be searched. Then the three blanks to be filled appear in the following order:

- (1) Form
- (2) Syntactic category
- (3) Meaning

In the form section, the learner needs to identify whether the target word is inflected. If so, he has to change it to the appropriate word form as a headword. Next the learner is required to decide on the syntactic category in context and select the most appropriate syntactic category from the dropdown list, including eight syntactic categories. As for verb, the distinction between transitive and intransitive is necessary because conventional English-Japanese dictionaries usually treat each as an independent subentry. Finally, after syntactic categorization, the learner fixes the contextual meaning. The learner needs to select the most suitable meaning from the dropdown list with six to ten meanings.

There are four levels of feedback given to the learner according to the correctness of the answer and the level of the preceding feedback for each section. The amount of feedback C-DADA provides per section is from one to four items. When a correct answer is provided by the learner, C-DADA gives feedback which verifies its correctness and allows him to go to the next step. In contrast, for a wrong answer, different types of feedback are given, which are structured and graduated from implicit to explicit. This way of feedback is an instance of locating and targeting learners' ZPD in order to be able to provide maximally beneficial assistance (e.g. Poehner, 2009; Rassaei, 2014). The first feedback is the most implicit that simply gives the second chance to answer. Likewise, the second feedback aims to direct the learner's attention to the part(s) relevant to solve the problem given in each section. The third feedback presents more explicit or direct clues or hints to help the learner to answer by adding more information to the second one. The fourth feedback is the last and most explicit, which presents the answer with an explanation. This feedback is given when the learner fails to answer correctly after receiving the third feedback. Except for the items, language used in C-DADA is basically the learner's L1 (i.e. Japanese), due to the reality of their dictionary use. This is because the target users of C-DADA are at a beginning or lower-intermediate level of L2 English, so that it is very likely that they may not understand the language of feedback in L2. It is also common knowledge that bilingual dictionaries have always enjoyed greater popularity with foreign language learners, even those at an advanced level (Dick-Bursztyn 2014).

Table 1 summarizes the types and levels of feedback given for each section. Note that comments in quotations in the table are translated into English for the convenience of the reader of this paper.

To understand the mechanics of C-DADA more clearly, showing the following example should be helpful. Suppose there are two students (student A and student B) who are individually working on the following item on C-DADA.

He *succeeded* to his father's business.

First student A is expected to identify whether the italicized target word '*succeeded*' is a base form (lemma) working as a headword in the dictionary. When he recognizes it as a base form and types '*succeeded*' into the space provided for the form section, C-DADA will give the first feedback

Table 1: The types and levels of feedback.

Feedback	Preceding Answer	Function	Section		
			Form	Syntactic Category	Meaning
1st	Wrong	To give the second chance to answer	To present “That’s wrong! Try again!”	To present “That’s wrong! Try again!”	To present “That’s wrong! Try again!”
	Correct	To lead the learner to the next step	To present “That’s correct!” and lead the learner to the syntactic category section	To present “That’s correct!” and lead the learner to the meaning section	To present “That’s correct!” and lead the learner to the next item
2nd	Wrong	To direct the learner’s attention to the surrounding context of the target word	To point out some part(s) of the target word or some word(s) relevant to identify the base form	To point out some word(s) relevant to identify the syntactic category of the target word	To point out some word(s) relevant to identify the meaning of the target word
	Correct	To lead the learner to the next step	To present “That’s correct!” and lead the learner to the syntactic category section	To present “That’s correct!” and lead the learner to the meaning section	To present “That’s correct!” and lead the learner to the next item
3rd	Wrong	To give more direct clues / hints than 2nd feedback	To explain morpho-syntactic context of the target word more directly than 2nd FB	To exhibit syntactic relationship between the word(s) pointed out in the 2nd FB and the target word	To give L1 translation of the surrounding words or partial translation of the sentence except the target word
	Correct	To lead the learner to the next step	To present “That’s correct!” and lead the learner to the syntactic category section	To present “That’s correct!” and lead the learner to the meaning section	To present “That’s correct!” and lead the learner to the next item
4th	Wrong	To present the answer with explanation	To present the correct base form of the target word with explanation	To present the correct syntactic category of the target word with explanation	To present the correct meaning of the target word with explanation
		To lead the learner to the next step	To lead the learner to the syntactic category section	To lead the learner to the meaning section	To lead the learner to the next item

Note: FB = feedback

“That’s wrong! Try again” (in Japanese). Then he gets rid of the ‘-ed’ inflected morpheme, and types ‘succeed’ into the same place, the second feedback is the given to verify this answer’s correctness by presenting “That’s correct!”, and displays the direction to go to the next section. Simultaneously the

dropdown list for the syntactic category appears. The student is then required to select one syntactic category from the list. It should be noted here that transitive and intransitive verbs are listed as an independent syntactic category. This means that if he first selects transitive verb for the above case C-DADA will give a comment “That’s wrong! Try again.” as the first feedback. Then if he continuously fails to select the correct syntactic category, the second feedback is presented. In the above case, because ‘*succeeded*’ is followed by a prepositional phrase, C-DADA attempts to direct student A’s attention to it by commenting “There is ‘*to his father’s business*’ after ‘*succeeded*’”. However, if he still cannot select the proper syntactic category, the third feedback is given. This time C-DADA gives a more explicit clue by presenting “There is ‘*to his father’s business*’ as a prepositional phrase and no noun phrase working as the object of ‘*succeed*’”. Then, when he selects intransitive verb from the list, C-DADA verifies it as the correct answer and gives the direction to go to the meaning section. Immediately, the dropdown list for the meaning comes out. For a wrong selection in the meaning section the first feedback gives the student another chance to answer, just as in the other two sections. In the second feedback, C-DADA points out some surrounding words of the target word which are expected to be helpful to guess its contextual meaning. If the student fails three successive times, C-DADA gives L1 translation of the words which are presented in the second feedback. However, if student can still not select the correct meaning in context from the list, C-DADA displays the answer with an explanation and allows him to move to the next item. Next the case of student B is shown.

Student B is working on the same item as student A. Like student A, student B’s first trial in the form section results in failure. After receiving the first feedback, she types ‘succeed’. Soon after verifying it as the correct answer, C-DADA allows student B to go forward to the syntactic category section. Again, her first trial results in failure. When the first feedback given, she successfully chooses the answer intransitive verb from the list and is led to the meaning section. However, here she has more troubles than the previous two sections. She repeatedly fails in finding the appropriate meaning in context. She needs the third feedback before her fourth answer is verified as the correct one.

This example thus illustrates how C-DADA works for the two students’ different answer patterns. Figure 1 shows a sample image of C-DADA.

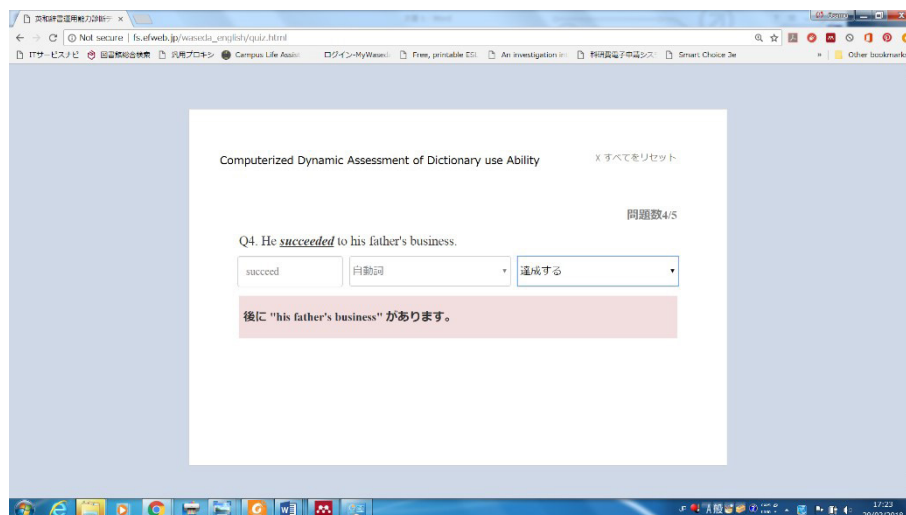


Figure 1: Sample image of C-DADA.

As in Figure 1, C-DADA presents items to be solved one by one. The learner must reach the meaning section and successfully answer regardless of the level of feedback or receive the fourth item of feedback due to making four successive mistakes before being able to see the next item. The learner



cannot go back, either. After the learner finishes the 50th item, the score report with task completion time will be automatically generated.

## 2.2 Scoring

In C-DADA the scoring system is based on Poehner and Lantolf (2013). There are two different scores per item: actual and mediated. The actual item score is a non-assisted score, the result of the first trial for each section. The point per section will be either 0 or 1 point, so that the score per item is the sum of the points of the three sections, which can range from 0 to 3. The mediated item score, in contrast, is an assisted score, the result of the learner's answer with feedback. If the learner can correctly answer for any section without feedback, she will receive the highest score (i.e. 1 point). However, with the increase in the number of items of feedback, the score per section will fall from 1.0 to 0 by 0.25 points. The points for the three sections are summed up so that the mediated score per item will range 0 to 3 by 0.25 points. Each item score is then summed up so as to produce two different types of scores for the entire task performance: actual and mediated. Both scores will range from 0 to 150 points, since C-DADA contains 50 items and first set can get 1 point each and the second 0.25. Furthermore, the points for the three sections (form, syntactic category and meaning) are individually summed up, which gives the three section scores. Like the item and task scores, each section score distinguishes the actual score (non-assisted) and the mediated (assisted) score (see Appendix 1 for the flow of the task and scoring procedure per item).

To understand the scoring process more clearly, the previous two students' cases (A and B) are illustrated. Student A solves a problem in the second trial in the form section, in the fourth trial in the syntactic category section, but cannot do so in the fourth trial in the meaning section. The points that he receives for the three sections will thus be 0.75, 0.25, and 0, respectively. Then these are summed up, resulting in 1.0 points as the mediated item score. Simultaneously C-DADA will present 0 points as the actual item score, because student A does not successfully answer in any section in the first trial. In contrast, student B succeeds in the second trial in the form section, in the second trial in the syntactic category section and in the fourth trial in the meaning section. C-DADA will thus give her 0.75, 0.75, and 0.25 for the respective sections, which makes the mediated item score 1.75 points. At the same time C-DADA will present 0 points as the actual item score, because student B does not solve a problem in the first trial in any sections, just like student A. In sum, student A and B's actual item scores are the same (0) while their mediated item scores are different: 1.0 and 1.75, respectively. From this, student B receives more gains from feedback than student A. This may suggest that student B is a potentially better dictionary user than student A, while they are superficially at the same level for this item in that both of them receive 0 points as the actual item score. In this way, C-DADA aims to numerically distinguish the learner's actual and potential level of dictionary use ability.

## 2.3 Target Word

There are 50 items presented in C-DADA. Each item consists of a short sentence with a bold, italicized target word. They are in either uninflected or inflected forms. All of the items are constructed based on the following criteria: First, the target items are polysemous words that have more than six meanings in the entry or subentry, and the majority of which have multiple syntactic categories. This may prevent the learners from selecting the meaning in context with ease. Second, non-target words, words used in the sentences, are carefully chosen to be possibly familiar to students. In fact, most of them are usually taught in junior high school. While some non-target words may be unknown to students, their meanings are supposed to be easy to guess from context. Third, parts of idioms or phrasal expressions are not set as target words. Although the ability to find them in the dictionary is undoubtedly important, it is outside the focus of this study. Fourth, the sentence structure of each

item is designed to be simple to support student understanding. For example, the items do not include relative clauses, participle clauses, or subjunctive mood, which are reported to be difficult grammatical items or structures for Japanese learners of English to understand (Chujo, Yokota, Hasegawa & Nishigaki 2012).

### 3 Future Research

While developing C-DADA is itself a lexicographic project, the future research goes one step further. The effectiveness of C-DADA will be examined in two different ways.

The first study will take the format of pretest-instruction-posttest: C-DADA is introduced as the instruction phase. The pre- and posttests have the same type of the task on C-DADA: to search the contextual meaning of the target word in a dictionary. After taking the pretest, the learners work on C-DADA. Then they take the posttest (retest). The results of the pretest and posttest will be compared to statistically examine the effects of C-DADA on their development of dictionary use ability.

In the second study, the learners' on-going development while working on C-DADA will be investigated. As already mentioned, assessing and learning are unifiable in DA; DA constructs an environment where learning occurs with the help of the assessor or others. Accordingly, it is expected that learners may show on-going development of dictionary use ability by receiving feedback from C-DADA. To find this, the individuals' task performances on C-DADA will be examined in detail. For example, if a learner solves a problem with less feedback at each section per item as he proceeds to the last item (i.e., the 50th item), he is assumed to have developed his dictionary use ability while working on C-DADA. Furthermore, if there are learners with the same actual task scores, their differences in potential dictionary use ability will be revealed by examining their mediated task scores and the amount and type of feedback they received to solve the problems.

### 4 Conclusion

This paper has presented C-DADA, a newly developed web-based learning resource. As seen so far, C-DADA has some unique features. First, C-DADA is an e-learning resource for lexicographic purposes. Second, C-DADA is a theory-driven approach, applying the principles of dynamic assessment which originated in Vygotsky's sociocultural theory of mind. Unlike the traditional assessment, C-DADA unifies instruction and assessment as a single unit. C-DADA assesses individuals' actual and potential levels of dictionary use ability while attempting to promote their learning. This will provide very valuable information on learners' ability of dictionary use to assessors. Furthermore, if the on-going project shows the effectiveness of C-DADA, it will be applicable to other language learning contexts as well. It is expected that C-DADA will make a contribution to language learning and the progress of lexicographic research.

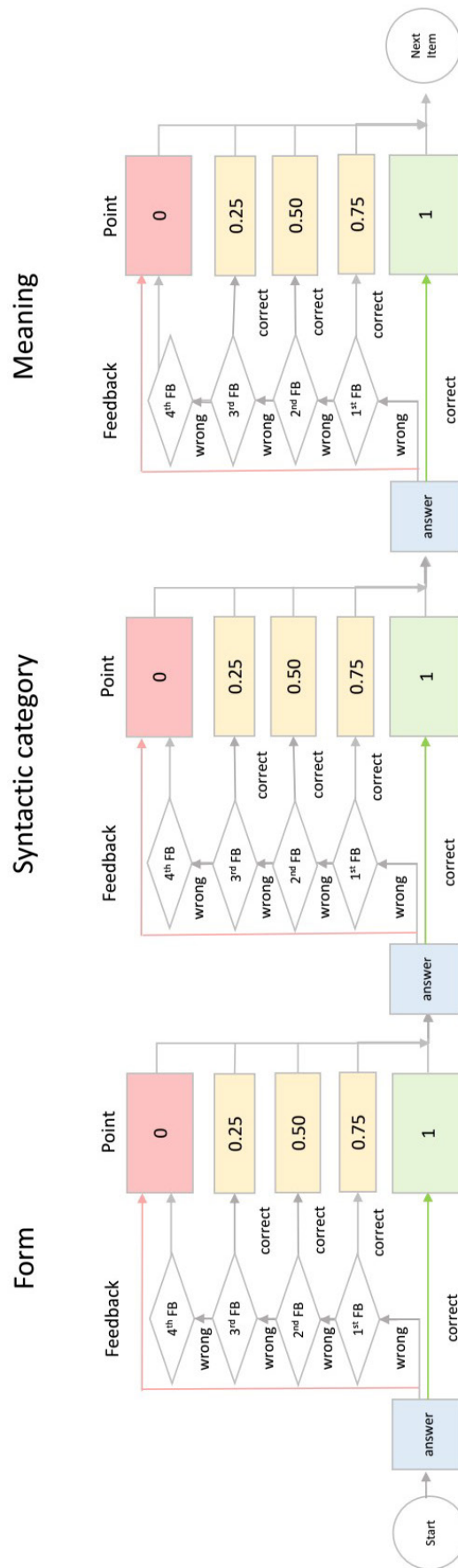
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Appendix



Appendix 1: Flow of the task and scoring procedure per item in C-DADA.