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Semantic Implicit Learning in Acquisition of L2 English

2015

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Abstract:
Communicative approaches to language teaching assume the learning occurs as a by-product of communication. The present study explores this issue experimentally, examining the phenomenon of implicit learning among Polish learners of English. The study focuses on learning to apply new English words in semantically appropriate contexts. Whether the learning is implicit or not is determined using subjective measures of awareness (following Z. Dienes/ R. Scott 2005). Polish learners of English read English sentences containing 4 target words. Next they completed an unexpected test on new sentences in which they were asked to indicate whether target words were used correctly and to provide confidence and source judgements to each answer, as subjective measures of awareness (guess/ intuition responses taken as reflecting implicit knowledge). The experimental group was compared with a control group who did not receive training. Findings include significantly above chance performance on guess/ intuition responses in both groups, with an advantage in the experimental group that approached significance, suggesting that this group may have indeed implicitly learnt about the applicable semantic contexts for the newly learnt words. The learning effect did not extend to appropriate but semantically different contexts to the ones participants saw in training, suggesting implicit learning is restricted in its scope. Educators must therefore ensure to provide representative sentence samples when introducing new words and may need to explicitly point out any contexts which semantically diverge from the ones the students were exposed to.

Introduction

The communicative approach to teaching arose in the 1970s as both linguists and educators grew dissatisfied with the then predominant audio-lingual and grammar-translation methods. It became clear that even despite elaborate explicit knowledge of language, learners often felt robotic and at a loss in natural, social situations. A solution to that was the development of new classroom methods and activities with the chief focus on communication and meaning, such as role-plays, interviews, information gap-fills, games, surveys and pairwork. Margie Berns, an expert in language pedagogy and sociolinguistics wrote: "language study has to look at the use (function) of language in context, both its linguistic context (what is uttered before and after a given piece of discourse) and its social, or situational, context (…)" (M. Berns 1983: 5). Of course

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[1] The author would like to thank her participants – students at the University of Economics in Krakow, Poland, as well as their English teachers and course coordinators who agreed for the data collection to take place.

underlying this framework is the assumption that learners will acquire the crucial aspects of language automatically.

Currently, the extreme communicative approach is not favoured any more, after succumbing to the criticism that plain "chatting" does not stimulate actual learning of the material necessary to improve competence (and confidence). Teachers nowadays are trained to apply a mixture of "focus on meaning" and "focus on form" methods and encouraged to balance them and use them for different purposes. The remaining crucial question is therefore: which aspects of language can be acquired naturally and automatically, as communicative approaches suggest, and which aspects require explicit teaching, as favoured by functional teaching methods?

The type of learning which communicative approaches assume takes place in second language learning is the one that occurs without an overt intention to learn a particular thing (in other words it is incidental) and without awareness of what is being learnt (as opposed to formulating explicit rules). In psychology this type of learning has become known as *implicit learning.* By popular assumption, the acquisition of the first language is an implicit learning process leading to implicit knowledge. To what extent a second language (L2) can also be learned implicitly, or in other words acquired, has been the subject of much investigation and rightfully deserves attention due to its important theoretical and practical implications, which will be discussed below.

In the field of second language acquisition research scepticism about the possibility of implicit learning is perhaps most clearly expressed in the work of Schmidt (R. Schmidt 1990, 1995), and resonates in his seminal "noticing" hypothesis. Schmidt was primarily concerned with the roles that attention and awareness play in the learning process. He proposed "noticing" to be the minimal combination of attention and a low level awareness, necessary and sufficient for converting input to intake (R. Schmidt 1990). He proposed that stimuli outside focal attention and therefore outside awareness might activate preexisting memory representations, but only subliminally, and that subliminal *learning* is impossible.

Once 'noticed', a given aspect of language may be consciously analysed, compared to other things which were 'noticed', giving rise to a higher level of awareness – 'understanding' (which involves what is generally understood as 'thinking'). Schmidt wrote sceptically about the possibility of forming generalisations and abstract rules without noticing at the level of understanding. But, could it be possible? This is the question which the current study addresses. Schmidt himself identified "unconscious induction and abstractness of the knowledge that results from learning" as "the most important issues involved in implicit learning studies" (R. Schmidt 1995: 35).

Working from a more pedagogical perspective, S. Krashen (1981) first proposed the distinction between unconscious acquisition and conscious learning. While certain aspects of language may be naturally acquired, others require conscious learning. Identifying exactly which ones can be acquired naturally is the Holy Grail for language pedagogues. In terms of lexical learning, M. Paradis (2004) proposed a distinction between 'vocabulary' and 'lexicon'. With vocabulary encompassing referential meaning ('cat' picks out CAT in the world) requiring explicit processes (N. Ellis 1994), other aspects of word-knowledge, such as collocational behaviour, belonging to the lexicon, may be implicit.

The focus of the presented study is on semantic implicit learning, that is pertaining to learning word meaning. In particular, the study addresses the learning of words' semantic (selectional) preferences. The term dates back to J. Sinclair (1996). Semantic preferences are tendencies of words to co-occur with words of certain semantic classes in a given role, e.g., the verb *chase* is followed by animate nouns as direct object, or *drink* by nouns denoting liquid. In short, the study examines whether learners exposed to new, previously not known English L2 words in written contexts are able to:

- incidentally develop sensitivity to the legitimate and illegitimate usage of the words in new but similar contexts (where context is operationalised as the type of nouns with which a given verb collocates);
- extend this sensitivity to new and semantically different contexts;
- assess to what extent the performance is based on implicit knowledge.

1. Experiment

Participants: 68 university students aged 19–23 at the University of Economics, Krakow, Poland. They were from 5 classes at the upper-intermediate/advanced level. The students within each class were divided into the experimental and control groups.

(1) Stimuli
Four target words of English: DIMINISH, DEPLETE, TRUNCATE, MITIGATE were chosen to specify the following conditions:

- Not have an easily identifiable counterpart in Polish. Otherwise the experiment would amount to a simple test for how many people can find the right equivalent. This was ensured by a pilot questionnaire where 7 Polish native speakers of an advanced command of English, judged the fit of the strongest Polish equivalent for each experimental stimulus and suggested other Polish words where the fit was low. The results indicated that none of the words have a single best equivalent, with *mitigate* having one fit for the most contexts, namely the word: *łagodzić*, which also means 'to ease', 'alleviate', 'smooth over' or 'commute' as in 'commute punishment'. The word *mitigate* does also have cognates in Polish: *mitygować* and *mitygować się* meaning 'stop someone else or oneself, respectively, from making a rash decision'. These are, however, very old fashioned expressions, possibly not even known by a number of participants, and crucially, used that way the word takes an animate patient as argument, which would not match the contexts provided in the experiment. Further elaboration on this issue will be mentioned in the discussion at the end. The Polish translation equivalents which could be applied in the experimental contexts are presented in Table 1. below.

diminish	deplete	truncate	mitigate
zmniejszać	*wyniszczać*	*ściąć*	*łagodzić*
umniejszać	*niszczyć*	*okroić*	*umilić*
pomniejszać	*pochłaniać*	*obciąć*	
ograniczać	*wypierać*		

Table 1. Polish equivalents of the learning targets appropriate
in the sentences used in Experiment 1.

- Be highly related in meaning, so that the context serves as the crucial cue for their differentiation. Here, all the words indicate 'reducing something' or 'making something smaller/weaker'. *Mitigate* indicates making an unpleasant situation or its effects less serious and less difficult to bear. Out of the four words it is the only one with a positive connotation. *Diminish* means 'to make something smaller', and is mostly used with abstract nouns, such as 'value' or 'importance', rather than concrete nouns, such as 'food' or 'house'. Out of the four words, only this one may also be used to deliberately make someone or something appear less important than they really are. *Deplete* means to reduce supplies of something to a level that is too low. Unlike 'diminish', it is usually used with tangible, material components. *Truncate* suggests reducing the length of something by cutting off a part of it.
- Be different enough from each other to find non-overlapping contexts where none of the other three words fits. This was ensured by a pilot study in which a group of 4 English native speakers were individually presented with experimental stimuli and asked to indicate whether 1) they would naturally use a proposed word in the contexts, and 2) if any of the other three words were possible there as well.
- Be unlikely to be known by an intermediate-level L2 English learner.

Contexts for training and test items were selected from the British National Corpus and the Brigham Young Corpus of American English which met the above contextual criterion. Figure 1. presents sample training sentences for each word and Figure 2. presents sample test stimuli.

(2) Procedure
(2.1.) Training
The experiment took place in a classroom environment. Half of a class was given full experimental training with 50 sentence contexts: 8 with each target word and 18 filler sentences. The other half of the class served as a control group and were given sets with the same sentences but with the target words paraphrased by synonyms. In the training task participants rated each sentence for how important the information was to them on a scale from 1 to 5. Examples of the training items are presented below (Example 1).

Each target word in the training constantly collocated with nouns from one semantic domain, and so:
- *mitigate* – with negative psychological states;
- *diminish* – with nouns of importance;
- *deplete* – with natural resources;
- *truncate* – with words denoting measurable strings of text.

A full list of target word arguments used in the training as well as the test is presented in Table 2.

Research shows that having strong ties to co-workers can help mitigate job related stress – a good reason to make some office buddies.

0	1	2	3	4
○	○	○	○	○

The economic crisis has visibly hit the university graduates who are just entering the workforce. Boston Consulting among many companies had to severely truncate the lists of accepted interns, leaving many hopeful youngsters jobless.

0	1	2	3	4
○	○	○	○	○

The public obviously has had enough of the prime minister trying to diminish the status of the president and vice versa.

0	1	2	3	4
○	○	○	○	○

In Nepal, 120,000 trekkers a year deplete forests by always using wood in lodges or houses for baths and cooking. Many forest dwelling animals are facing extinction as a result.

Example 1

(2.2.) Test

The test was unexpected. Participants were not informed beforehand in order to create an incidental learning condition. Both the experimental and control groups received the same test. Stimuli were semi-randomised, with the same word never appearing twice on the same page. There were 48 sentence contexts: 12 for each word, 6 times used correctly, 6 times incorrectly. The task was to determine whether the target word, presented in capitals, was used correctly or not. Participants were also asked to indicate the source of their judgement. Figure 2. presents an example test sentence with the tasks. Subjective measures of awareness were modelled after Z. Dienes/ R. Scott (2005). "I formulated a definition" is akin to their 'rule' category, "I remembered a similar sentence" is akin to 'memory', and "I knew before what the word means" is included here to catch cases where the participants already knew the word.

The bad news did not DIMINISH her enthusiasm for the plan, she remained just as excited as she was before.

Is the word correct?		*How did you mark your answer?*
		○ - by guessing
		○ - intuition
		○ - I formulated a definition and used it
YES	**NO**	○ - I remembered a similar sentence
		○ - I knew before what this word means

Figure 2. Example test item

The correct uses were divided into two subtypes: the items where the target collocated with semantically similar arguments, and those involving extension to a new

semantic domain. To illustrate, the word *truncate* in the training only appeared collocating with members of the category of textual strings (e.g. *message*, *lists*). Therefore 3 of the 6 correct test items presented *truncate* with new textual strings (not encountered in training). The remaining 3 correct items involved *truncate* collocating with nouns from a new semantic domain, in this case nouns of temporal duration. In these sentences, like in all sentences where it appears, *truncate* is the only word out of the four targets to possibly fit semantically. However, in order to correctly judge the acceptability of *truncate* in the new, extended contexts the participants would have to have learned something about the meaning of *truncate* that differentiates it from the other words. Table 1.2. illustrates the distribution of nouns in the training and test, arranged into semantic types.

The 6 incorrect stimuli were also not random, as they consisted of the target words presented with the noun type where a different target word appeared in training (3 times) and where a different word was used as an extension context (3 times).

	TRAINING	SAME TYPE	EXTENSION TO…
MITIGATE	*Negative psychological states*: Grief Pain Stress Depression Loss Suffering Despair Agony	Humiliation Frustration Fear	*Natural disasters* Climate change Global Warming Flood damage
DIMINISH	*Importance:* Force Input Influence Significance Prominence Greatness Status Role	Accomplishment Reputation Importance	*Feelings:* Enthusiasm Gratitude Desire
DEPLETE	*Natural/biological resources:* Ozone layer Forests Nitrogen Oxygen Carbohydrates Natural resources Water reserves Essential nutrients	White blood cells Serotonin Oil supply	*Financial resources:* Money Treasury Savings
TRUNCATE	*String of text (length)* Line Message Text Lists Sentences File Section Website URL	Password Document Manuscript	*Nouns for temporal duration:* Transmission Show Presentation

Table 2. Words and their arguments in the well-formed sentences in training and test

(2.3.) Post-experiment questionnaire
The test was followed by a short questionnaire in which the students were asked 1) whether they saw the target words in the first part of the experiment (with the aim of indicating to the experimenter which group they belonged to), 2) whether they had any ideas about what these words mean, 3) to estimate how much of the training text they understood, 4) whether they were trying to figure out the meanings of the target words as they were doing the test, 5) to provide any further comments.

(3) Results
Overall accuracy in the experimental group (n = 35) was 56.1%, SD = 0.11, whereas among the control group (n = 27) it was 51.8%, SD = 0.06. The difference between the groups achieved significance at $t(26) = 1.97$ $p < 0.05$ in a one–tailed t-test. Figure 3. below presents the distribution of responses across the source judgements.
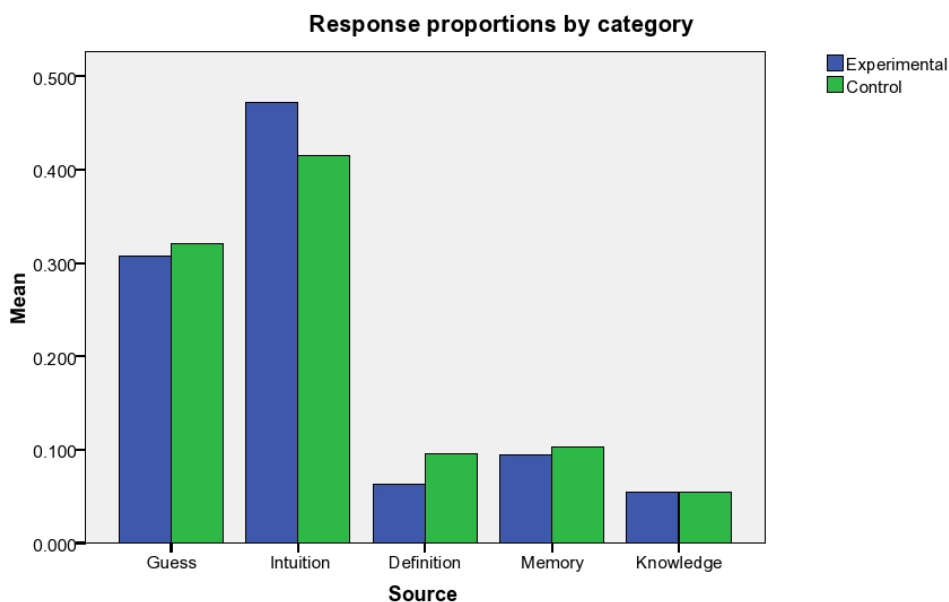

Figure 3. Response proportions by category

Most participants cited 'guess' and 'intuition' as sources of their judgements. Following Z. Dienes/ R. Scott (2005), such responses are presumed to reflect implicit knowledge. The following analysis therefore includes only these answers.

Truncate turned out to be the only word for which the trained group did not outperform the controls numerically.
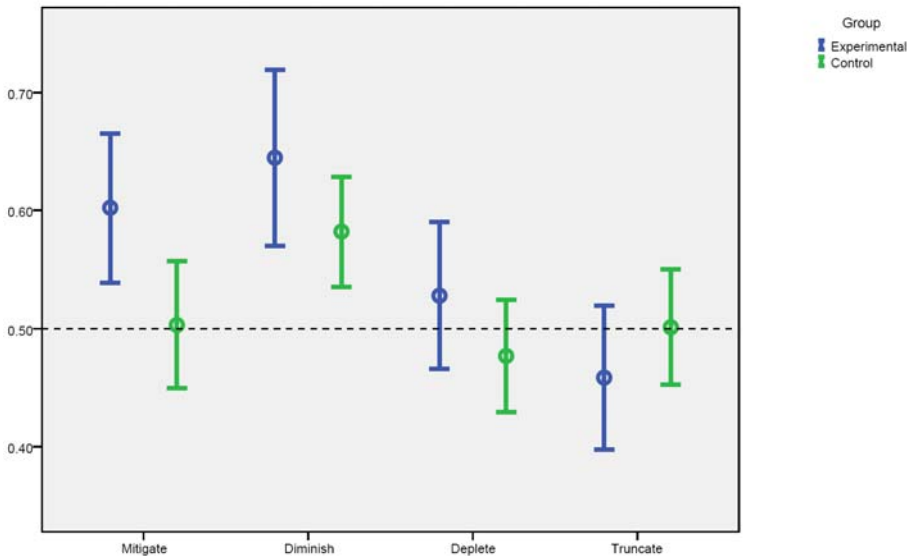
Figure. 4. Accuracy of the implicit source responses by word, 0.5 CI

The word *truncate* turned out also to be the only word that failed to show any learning effect even on the grammatical items in the similar contexts to training. Since there are independent reasons for expecting this word to be the hardest to learn (see 2. Discussion) it has been excluded from the following analyses.
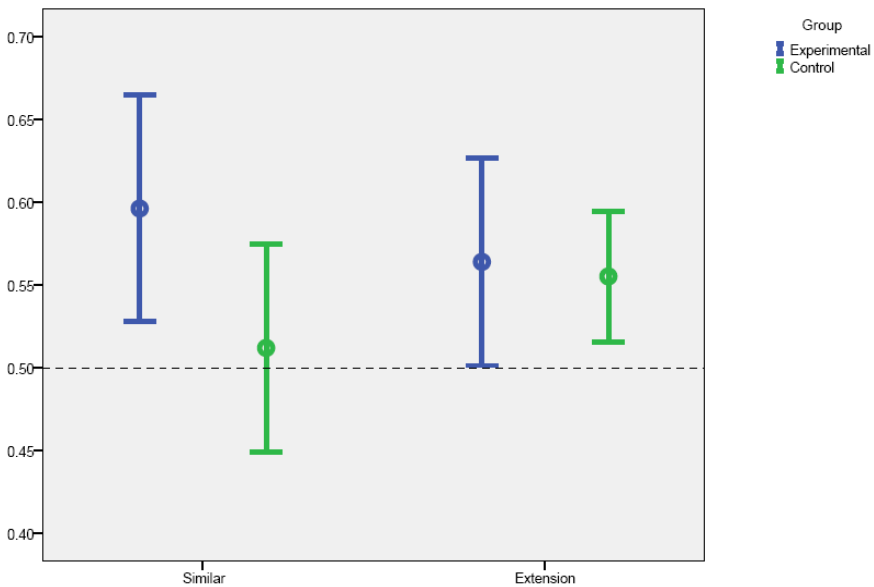

Figure 5. Accuracy in similar and new contexts (extensions) for implicit source, 0.5 CI

Excluding *truncate*, in the similar contexts the experimental group outperformed the control group, $p < 0.05$ (one-tailed t-test), whereas there was no significant difference in

the extension context. This suggests implicit knowledge of word usage in similar contexts only.

As mentioned above, in the test each word appeared 12 times, 6 times correctly and 6 incorrectly. Out of these 6, 3 times the word was used in similar contexts as in training and 3 times in contexts which were correct (grammatical), but semantically different to the training items (extended contexts). Figure 6. presents accuracy for the grammatical and ungrammatical items in similar and extended contexts for the answers marked as guesses and intuition. On these implicit judgements, planned comparisons showed that the mean accuracy of the experimental group on grammatical items appearing in similar contexts to the ones in training (70%) was significantly different from the control groups' performance (59.5%), $p < 0.05$. No differences were found in the other conditions.
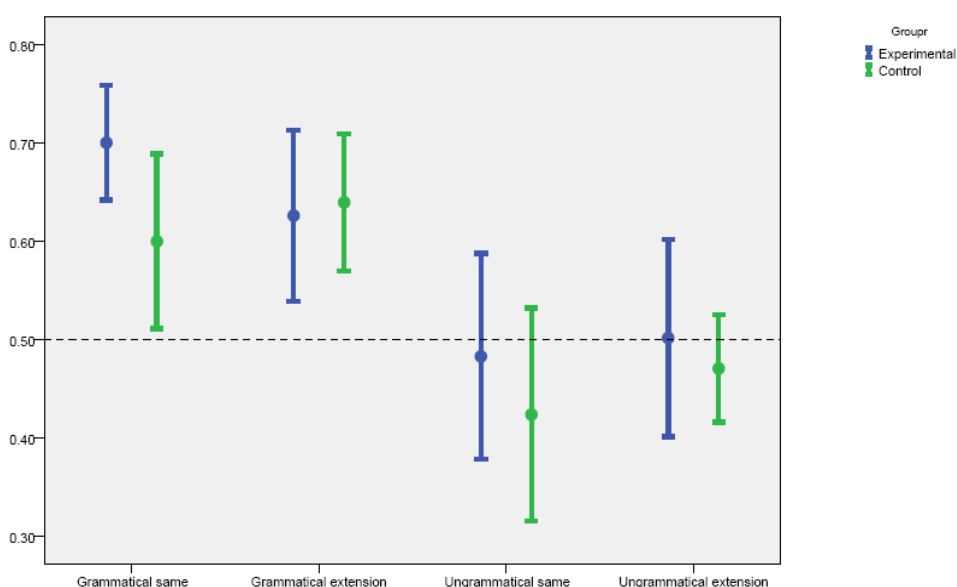

Figure 6. Accuracy for grammatical or ungrammatical items in similar or extended contexts for implicit source, 0.5 CI

2. Discussion

The experiment presented here confirms findings emerging from psychology literature that semantic generalization does take place implicitly (A. Paciorek/ J.N. Williams 2015, A. Goujon 2011, T. Goschke/ A. Bolte 2007). It is the first study to demonstrate it outside the lab, in a natural, second language learning environment. Learners seem able to incidentally develop sensitivity for the legitimate uses of new words in novel contexts that are semantically similar to the ones to which they have been exposed. They do not appear to extend this knowledge to semantically different novel contexts, or to reject incorrect uses. Nevertheless, because their performance is so different on the two types of contexts (similar and new) they must implicitly have formed certain generalisations about the semantic environment accompanying the words. It is remarkable that an effect was obtained despite the fact that none of the words appeared with the same noun

collocate more than once. The fact that the experimental participants performed better on grammatical test items similar to the training items than on completely novel ones is reminiscent of the research in implicit learning in other domains (P. Rebuschat/ J.N. Williams 2009, J.N. Williams/ C. Kuribara 2008), where similar stimuli usually attract strongest learning effects, and learning is weaker – if at all – on novel applications. Future work should shed light on the extent to which this generalisation may occur and what it is driven by.

The word *truncate* was excluded from the analysis as it did not show any learning effect even in similar grammatical contexts. This might be attributed to the fact that it is most dissimilar in form from any other words in the L1 Polish. Although unidentified in the initial study of Polish translation equivalents for the experimental sentences, there do exist Polish words which are similar in form to the English target words: *mitigate – mitygować, diminish – minimalizować, deplete – wypleniać. Truncate* was therefore the only target word whose form had to be learned from scratch. The notion that pre-existing forms may have facilitated learning could also be supported by the fact that the control groups performed quite accurately on the word *diminish,* even on answers ascribed to an implicit source. This suggests possible availability of a concept connected to a cross-linguistically similar form, which may in turn, guide the intuitions about the use of a novel L2 word.

Although the results support the hypothesis that learners indeed have implicit semantic knowledge about the meanings of words they do not explicitly know, still it is hard to say whether this knowledge was developed through the experimental training given or whether they had developed it before. In particular, the fact that the control group was also above chance in their performance on grammatical items suggest that they overall indeed had some implicit knowledge. After all, the target words exist in English and it is impossible to quantify the possible exposure participants may have had to them prior to the experiment.

In all, the results presented here do provide empirical support for the assumptions underlying communicative approaches to language teaching, namely that learners can develop linguistic knowledge pertaining to word use without explicit mediation. Educators should however bear in mind that such knowledge will extend only to semantically similar (albeit new) instances. When it becomes known what drives or limits the process of semantic generalisation it might be possible to make specific recommendations about the optimal learner exposure of new words in different contexts for efficient acquisition.

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