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PROCEEDINGS OF THE ICGL12
ΠΡΑΚΤΙΚΑ ΤΟΥ ICGL12

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THE ACQUISITION OF ANCIENT GREEK VOCABULARY

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Περίληψη

Διερευνήθηκε αν οι παράμετροι της φωνητικής μορφής, σημασίας και γραμματικής κατηγορίας μπορούν να ορίσουν τη δυσκολία της εκμάθησης του αρχαίου λεξιλογίου εκ των προτέρων. Σχεδιάστηκε ένα πείραμα, αλλά καμία από τις εν λόγω παραμέτρους στατιστικά δεν έδειξε επίδραση. Συμπληρωματικά, η εκτίμηση των καθηγητών για τη δυσκολία των ίδιων λέξεων διερευνήθηκε. Η εκτίμησή τους δεν συνέπεσε με την πραγματική δυσκολία, αλλά με τη δική τους οικειότητα με τις λέξεις. Βάσει των εμπειρικών δεδομένων διατυπώνονται διδακτικές συμβουλές.

Keywords: Ancient Greek, vocabulary acquisition, language acquisition

1. Introduction

Many studies on foreign language acquisition stress the importance of vocabulary. It is estimated that the known vocabulary should cover approximately 95% of a text (Laufer 1992). For this coverage, knowledge of the 3000 most frequent word families (about 5000 words) is needed (Nation 1993). For that reason, there is a huge body of literature on various aspects of the acquisition of modern languages, mainly focussing on learning approaches (see de Groot 2010 for an overview). Research of the acquisition of Ancient Greek vocabulary is restricted to Vis 2013, who compares two learning ap-

proaches.¹ This despite the fact that Ancient Greek is being taught in many schools in the (Western) world. In order to improve the teaching of Ancient Greek, better insight in the acquisition by pupils is needed.

This article investigates the notion of difficult words in vocabulary acquisition. For teachers it is useful to know which words are difficult for students to learn in order to adapt their teaching methods. They may, for example, skip difficult words, offer them in later stages of the curriculum or focus more on them. The crucial question is whether there are innate criteria to define difficult words a priori. If this were the case, teaching material can take account of it. If not, the definition of difficult words can only be understood a posteriori, because students tend to forget specific items.

The structure of this article is as follows. In the next section the background of research is given. Based on the existent literature, the aspects of phonetic form, meaning and additionally grammatical category are tested as potential criteria. The method and results of this experiment are presented in section 3 and 4. These results are compared with those of a survey among teachers (section 5) followed by the conclusion and didactic suggestions in section 6.

2. Background of research

The studies of de Groot (2006 & 2010) are a systematic attempt to define difficult words. The author focuses on four possible criteria: phonetic form, frequency in the native language, relatedness with known words in the native language and meaning.

2.1. Phonetic form

De Groot (2006 & 2010) suggests that words with a phonetic form, which is impossible in the native language, are more difficult to acquire. She explains this assuming that learning new sounds or sequences of sounds requires extra activities in the brain. By learning phonetically familiar words, learners can only focus on the new meaning and form.

1 Possibly related is Shapiro & Waters (2005) who investigate the acquisition of Latin vocabulary. Although both languages are very different from each other, they have similar teaching practices. Both are being taught for reading only, usually have the same target group and the traditional method of grammar and translation is most common.

2.2. Frequency in the native language

De Groot (2006 & 2010) also investigated whether the frequency of a word in the native language influences the acquisition. The conclusion was that the words with a frequent translation in Dutch were better acquired than the infrequent words. She ascribes this result to the fact that the concept of frequent words is already present in the brain. Infrequent concepts, however, need to be acquired as well. This will take more brain activities.

2.3. Relatedness

Foreign words that are related to words in the native language are easier to understand than unrelated words (De Groot 2006 & 2010). De Groot explains this by assuming that learning a related word requires fewer brain activities, because the word is already (partially) present in the brain.

2.4. Meaning

According to de Groot (2006 & 2010), also the meaning affects the acquisition. Her data suggest that abstract concepts are harder to learn than concrete concepts. For example, abstract ‘destruction’ would be more difficult than concrete ‘boat’. De Groot explains this assuming that the acquisition of the latter category requires fewer brain activities than the acquisition of the former category.

2.5. Grammatical category

Another possible parameter that defines the difficulty of vocabulary is the grammatical category. Students sometimes indicate that verbs, adverbs and particles are harder to learn than substantives. A possible explanation is that verbs and adverbs in general have a more abstract meaning and abstract concepts may be more difficult to acquire. However, empirical data to verify this suggestion are not available and regular learning tasks include all sorts of categories. We included the role of the grammatical category in this research in order to fill this gap,

The textbooks which are used in the Netherlands do not draw much attention to possible difficult words. The widely used textbook *Pallas* (Jans et al. 2003) offers a small frame after each chapter in which pupils are supposed to write down difficult words

and their Dutch translation. Another frequently used textbook *Kosmos* (Holwerda et al. 2006) does not pay any specific attention to difficult words.

3. Method

We investigated what criteria can define the concept of difficult words. We designed an experiment in which several possible parameters are tested. In many respects, we adopted the studies of de Groot (2006 & 2010). We made some changes however. First, the participants consisted of real school children and were actually learning Greek at the moment of the experiment. De Groot (2006 & 2010) used paid students instead. Second, we used existent Ancient Greek words as test items, whereas de Groot (2006 & 2010) used nonsense words. Finally, we included several grammatical categories in the test material, contrary to de Groot (2006 & 2010) who used only substantives. These three changes aim to make the experimental task as realistic as possible for the target group.

We formulate the following hypotheses based on the studies of de Groot (2006 & 2010): A) phonetically marked words are more difficult than phonetically unmarked words; B) abstract words are more difficult than concrete words. In the line of hypothesis B), we add two more hypotheses: C) verbs are more difficult than adjectives and substantives (due to their -in general- more abstract meaning); D) adjectives are more difficult than substantives (due to their -in general- more abstract meaning). A hypothesis is confirmed in the case when the assumed more difficult category has a statistically worse score than the assumed easier category ($p < 0.05$). A hypothesis is rejected if the results are statistically the same or the reverse ($p < 0.05$).

The participants were 27 school children from the third grade. They formed a regular teaching group at their school. The participants had been learning Ancient Greek for two and a half years and most were of the age between 14 and 15.

The material consisted of 30 Ancient Greek vocabulary items divided in six groups of five. This grouping is based on the parameters discussed in section 2. Two factors discussed in de Groot (2006 & 2010), frequency and relatedness, are not tested in this study. In the case of the former, it is impossible to find a substantial body of unknown but frequent words. Related Greek words very often resemble Dutch words. Adding these to the test would possibly make it a test of knowledge of Dutch vocabulary instead of learning new Ancient Greek vocabulary.

The five groups of test items are the following:

A. Phonetically unmarked + concrete

καυλός	[kaulos]	stalk
λέμβος	[lembos]	boat
ἄκος	[akos]	medicine
κάνης	[kanes]	mat
ταρσός	[tarsos]	foot sole

B. Phonetically unmarked + abstract

κάρος	[karos]	sleep
λήμα	[lema]	desire
βάγμα	[bagma]	sound
δάκος	[dakos]	bite
δέννος	[denos]	abuse

C. Phonetically marked + concrete

κώληψ	[koleps]	hollow of the knee
ξυρόν	[ksyron]	razor
ψόφος	[psofos]	creaking
πτόρθος	[ptortos]	branch
κτίλος	[ktilos]	ram

D. Phonetically marked + abstract

φθόνος	[ftonos]	envy
κτῆμα	[ktema]	property
κάμψις	[kampsis]	bending
φθορά	[ftora]	destruction
πταρμός	[ptarmos]	sneeze

E. Verbs

λιστρεύω	[listreuo]	dig
κεντέω	[kenteo]	incite
πειραίνω	[peiraino]	bind

ταρχύω	[tarxyo]	embalm
δάπτω	[dapto]	tear up

F. Adjectives

λιτός	[litos]	smooth
κεστός	[kestos]	embroidered
πελλός	[pelos]	dark
τηκτός	[tektos]	melted
δηρός	[deros]	long

Table 1 | Test items

A few notes should be made concerning the phonetic transcription of Ancient Greek, because various pronunciation systems are in use. In this study we use the pronunciation system as indicated in the Dutch textbooks. This system is mainly based on the Erasmian pronunciation and Dutchified to a great extent. For example, difference between long and short vowels is neglected and the aspirated plosives [p^h] and [k^h] are pronounced as the fricatives [f] and [x], which occur in Dutch. As a result, there is no difference between Dutch phonology and Dutchified Ancient Greek at the level of single phonemes. There are however differences in phonotactics. For example, tau-tosyllabic sequences such as [pt] or [kt] are common in Ancient Greek but marginal in Dutch.

All nouns and adjectives are bisyllabic. This was done to avoid making word length an additional parameter. Verbs are bisyllabic or trisyllabic and of the active clitic paradigm, because these are most common in Ancient Greek.

We carried out the experiment during a regular class hour while the teacher was present. Participants had 15 minutes to learn the 30 items. We chose this short period of time in order to force incomplete learning. The items were presented in random order in five different versions. Instruction was written and clarified orally by the researcher.

An announced post-test was held after 15 minutes of learning. We tested all items. The test displayed the items in random order in five different versions aiming to level out the order effect of learning and / or testing.

We followed conventional learning and test procedures during the experiment. This means that the learning task and test were written on paper and not in digital form.

The vocabulary items of the learning task were offered paired-associate and the test consisted of giving the Dutch translation of the Greek words, also in a paired-associate style. This was done to ensure the focus on learning the vocabulary items and avoid any distraction due to new learning and testing procedures.

Before the actual experiment, we held a pilot with a small test group in order to check the material and procedures. We did not make any changes based on this pilot.

4. Results

A score point was given for every correct answer. Answers were considered correct when the exact translation was given or a synonym of it, as long as it retained the same grammatical category. A low score per category would imply that these items are more difficult to learn. A high score would suggest easier acquisition. The full results are presented in table 1 below.

Cat.	Item	N of item	Total N of a cat / Total N
A	ἄκος	9	60/135
A	κάνης	11	
A	καυλός	17	
A	λέμβος	11	
A	ταρσός	12	
B	βάγμα	17	69/135
B	δάκος	13	
B	δέννος	10	
B	κάρος	13	
B	λήμα	16	

C	κτίλος	16	57/135
C	κώληψ	15	
C	ξυρόν	12	
C	πτόρθος	7	
C	ψόφος	7	
D	κάμψις	5	40/135
D	κτῆμα	2	
D	πταρμός	6	
D	φθόνος	10	
D	φθορά	17	
E	δάπτω	7	60/135
E	κεντέω	12	
E	λιστρεύω	19	
E	πειραίνω	15	
E	ταρχύω	7	
F	δηρός	16	49/135
F	κεστός	10	
F	λιτός	5	
F	πελλός	9	
F	τηκτός	9	

Table 2 | Full results

As can be observed, the phonetically marked words with abstract meaning had the lowest score of 40, whereas the phonetically unmarked words with abstract meaning scored best with a score of 69. The other categories are in between these results.

The results were compared using a t-test and additionally a Mann-Whitney test. The latter was chosen because the results showed a large degree of dispersion.

As both tables show, no comparison has the statistical significance of $p < 0.05$. Close are B (phonetically unmarked + abstract) compared to D (phonetically marked + abstract) and F (adjectives). This suggests a tendency that phonetically marked words with abstract meaning and adjectives are more difficult to acquire than phonetically unmarked words with abstract meaning. All other categories seem of equal difficulty level.

	A	B	C	D	E	F
A		0,35	0,80	0,22	1,00	0,36
B			0,33	0,09	0,52	0,11
C				0,33	0,85	0,56
D					0,28	0,58
E						0,48
F						

	A	B	C	D	E	F
A		0,3472	0,9203	0,1738	0,9203	0,2113
B			0,3472	0,1443	0,5287	0,0949
C				0,2983	1	0,7566
D					0,2113	0,6745
E						0,6745
F						

Table 3 | Statistic comparison of the results with t-test (left) and Mann-Whitney (right)

5. Teachers' estimation

We also investigated to what extent the intuition of teachers corresponds to the empirical data. If there is a great correspondence, teachers may well know what difficult words are and use this knowledge in order to make their courses better fit to the situation. The hypothesis is formulated as follows: teachers know what difficult words are. The hypothesis is confirmed when teachers can correctly predict what words are harder to learn. This means that there is a firm correlation between the results of the test and the teachers' estimation about the difficulty of the same words.

We designed an online questionnaire, which was distributed by the Dutch association of classicists. This association has about 1000 members among whom many are teachers. The questionnaire was anonymous and consisted of two parts. The first part asked about experience and professional setting. The results are given in table 4 below.

Q1: At what type of school are you working?	N of responses	% of total responses
Only Gymnasium ²	13	36.11%
Mixed types	22	61.11%
No answer	1	2.78%

Q2: How many years of experience do you have?	N of responses	% of total responses
Less than 5	3	8.33%
Between 5 and 10	8	22.22%
Over 10	25	69.44%

Q3: At what level do you mainly teach?	N of responses	% of total responses
Mainly beginners	2	5.56%
Mainly advanced	4	11.11%
Both beginners and advanced	30	83.33%

Table 4 | General questions

Based on the answers, we concluded that the population was representative for the teachers in the field.²

In the second part of the questionnaire, we asked for the same words how difficult it would be for pupils to learn. Participants had to answer with a degree of difficulty ranging from one star (= easiest) to three stars (= most difficult). We chose stars in order to stress a relative degree of difficulty. By doing so, specific qualifications such as easy or difficult were avoided. We forced a deliberate choice of the participants due to a limited number of options. Every choice has been counted and an average has been calculated. This is a number between 1.00 and 3.00. The complete results are shown in table 5. The results are grouped per category, as being the focus of this research.

² At the Dutch school type 'Gymnasium' Latin and Ancient Greek are offered. Some schools consist of only this type, others include other school types without Ancient Greek and Latin as well.

Greek	English	cat.	# 1 star	# 2 stars	# 3 stars	Average stars
κάνης	mat	A	5	16	15	2,28
λέμβος	boat	A	16	16	4	1,67
καυλός	stalk	A	11	18	7	1,89
ταρσός	footsole	A	11	15	10	1,97
ἄκος	medicine	A	13	17	6	1,81
βάγμα	sound	B	15	10	11	1,89
δέννος	abuse	B	4	3	29	2,69
κάρος	sleep	B	10	20	6	1,89
δάκος	bite	B	30	6	0	1,17
λήμα	desire	B	12	17	7	1,86
κώληψ	hollow of the knee	C	8	11	17	2,25
κτίλος	ram	C	12	18	6	1,83
πτόρθος	branch	C	8	14	14	2,17
ξυρόν	razor	C	20	11	5	1,58
ψόφος	creaking	C	13	17	6	1,81
πταρμός	sneeze	D	10	12	14	2,11
κτῆμα	property	D	31	5	0	1,14
φθορά	destruction	D	25	10	1	1,33
φθόνος	envy	D	26	9	1	1,31
κάμψις	bending	D	9	19	8	1,97
λιστρεύω	dig	E	4	10	22	2,50
πειραίνω	bind	E	7	18	11	2,11
ταρχύω	embalm	E	6	7	23	2,47
δάπτω	tear up	E	14	16	6	1,78
κεντέω	incite	E	9	16	11	2,06
τηκτός	melted	F	9	1	12	2,08
κεστός	embroidered	F	9	16	11	2,06
λιτός	smooth	F	21	12	3	1,50
δηρός	long	F	16	16	4	1,67
πελλός	dark	F	14	155	7	1,81

Table 5 | Teachers' estimation

We composed a ranking of difficulty based on the average degree of difficulty (according to the teachers' estimation). The highest ranking items are estimated to be the easiest to learn, whereas the lowest ranking items are expected to be the most difficult ones. The teachers' ranking was compared with a ranking of the actual scores of the participants. In this case, the items with the highest scores are ranked high, being the easiest words to learn. The lowest ranking items had low scores in the vocabulary test. Both rankings are compared in table 6.

Item	Ranking teachers	Ranking participants
κτῆμα	1	30
δάκος	2	11
φθόνος	3	18
φθορά	4	2
λιτός	5	28
ξυρόν	6	13
λέμβος	7	15
δηρός	8	5
δάπτω	9	24
ἄκος	10	22
ψόφος	11	25
πελλός	12	21
κτίλος	13	6
λῆμα	14	7
καυλός	15	4
βάγμα	16	3
κάρος	17	10
ταρσός	18	14
κάμψις	19	29
κεντέω	20	12
κεστός	21	17
τηκτός	22	20
πταρμός	23	27
πειραίνω	24	8
πτόρθος	25	26

κώληψ	26	9
κάνης	27	16
ταρχύω	28	23
λιστρεύω	29	1
δέννος	30	19

Table 6 | Teachers' estimation vs. pupils' scores

There are great differences between the teachers' estimation and the actual score of the participants. For example, the word κτήμα is considered very easy to learn by the teachers. However, this item had the lowest score at the vocabulary test. The highest score had the item λιστρεύω, which was considered to be the next difficult word to learn according to the teachers. Differences in ranking of 10 or more have been highlighted in the table, which are 12 out of 30 items. The lack of correspondence between both rankings is very well illustrated in table 7.

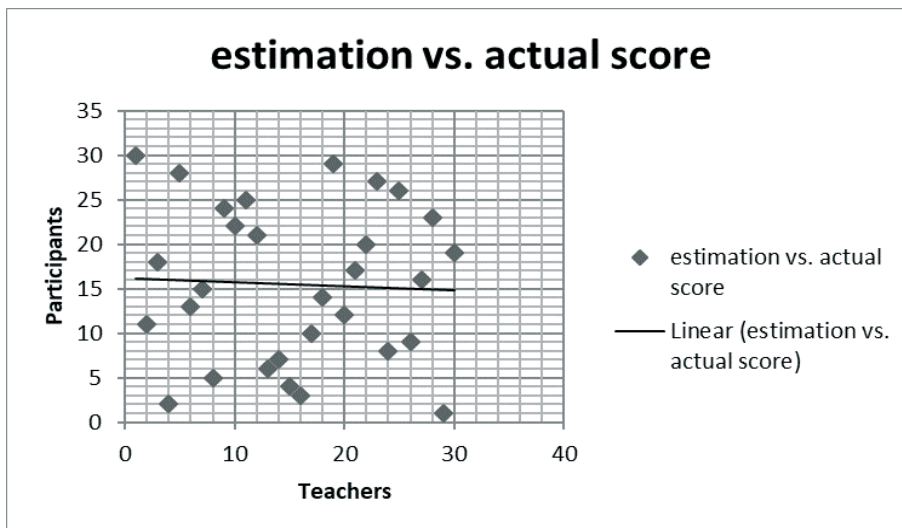


Table 7 | Estimation vs. actual score

In the scatter diagram of table 7 the horizontal axis denotes the teachers' ranking, the vertical axis indicates the actual score of the test. A diamond in the lower-left corner represents a word that is considered easy by the teachers and also according to the

test. A diamond in the upper right corner is difficult, both by the teachers' estimation and in the vocabulary test. A firm correlation between both rankings would end up in a linear from the lower left to the upper right corner. The diagram however shows a nearly horizontal linear, meaning that there is virtually no correlation between both parameters (Pearson's $r = -0.05$)

This result supports the idea that there are no general parameters, based on which the degree of difficulty of words can be defined a priori. Teachers may have some general categories in mind and based on this they define the difficulty of vocabulary items. However, this basis is fallacious.

This poses the question what teachers may have in mind by defining difficult words. Their own familiarity with the item is a potential parameter. Familiarity can be expressed by means of frequency in the texts. The frequency data are collected from the Perseus project (www.perseus.tufts.edu). This site contains (among others) most Ancient Greek texts and interactive search tools. One of these tools is a weighed frequency expressed per 10,000 words. The weighing consists of the fact that the length of the corpus is taken into consideration. By doing so, a high frequency in short texts is levelled out.

The words used in this experiment had a weighed frequency between 1 and 5050. Three items did not have a frequency rate and were removed from any further calculations. We set up a ranking from 1 to 27 based on the frequency. The most frequent words are the highest ranked. We compared this ranking with the teachers' ranking in the same manner as has been done in table 6. The results are shown in table 8.

The horizontal axis indicates the ranking according to the teachers' estimation. The relative frequency of each word is expressed by the vertical axis. A diamond in the lower left corner means that this word is considered easy according to the teachers and has a high frequency. A diamond in the upper right corner means that this item is difficult with a low frequency. A firm correlation between the teachers' estimation and frequency would end up in a linear from the lower left to the upper right corner. This is indeed the case (Pearson's $r = 0.75$). These results support the idea that teachers define difficult words based on their own familiarity with the item.

6. Conclusion and didactic implications

In the previous sections, we discussed whether difficult vocabulary can be defined a priori in terms of general parameters. We researched three parameters: phonetic form

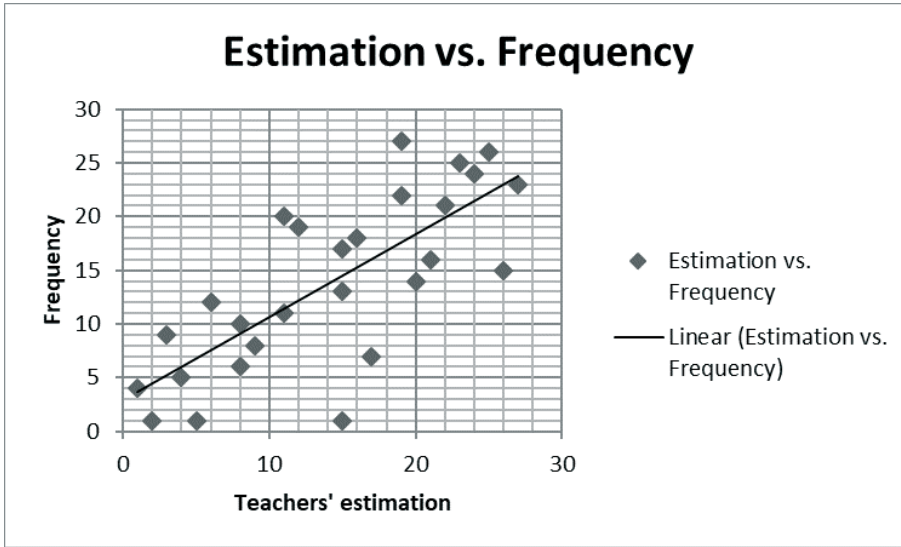


Table 8 | *Estimation vs. frequency*

(familiar vs. non familiar), meaning (abstract vs. concrete) and grammatical category (substantives, adjectives and verbs). We investigated the degree to which these parameters may interact with vocabulary acquisition by means of a learning task. The results show no clear interaction and the conclusion therefore is that difficult words cannot be defined in general terms a priori.

This conclusion is supported by a questionnaire in which teachers were asked to estimate how difficult a word would be for pupils to learn. No correlation was found between the teachers' estimation and the actual scores of the test. The basis of their answers seems to be their own familiarity with the items. There was a firm correlation between frequency of the words and the teachers' estimation. This leads to the conclusion that teachers tend to think about the learning tasks from their own perspective and not from that of the pupils.

Based on the empirical data, it is not possible to define a priori what difficult and easy words are. For that reason, it seems impossible to include specific exercises for specific words in the textbooks. Also teachers cannot help in selecting some items that would need more attention. Difficult words however can be defined a posteriori on an individual base. This means that diagnostic tests are needed in order to find out which items are difficult to learn for whom. Pupils then can make specific class

notes after every test and keep them in a vocabulary portfolio. Consequently, they can pay extra attention to these items, e.g. by means of extra tests, exercises, puzzles, quizzes, etc.

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