Learning terminology from reading texts in English: The effects of note-taking strategies

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Abstract
Student note-taking strategies can provide an insight into how students learn subject-specific terminology in L2 from L2 reading. This article explores the relationship between reading, note-taking strategies, and the learning of English terms among Swedish students. Students participated in an experiment in which they were presented with new terminology and could take notes. Their learning was measured with a multiple-choice test. Results show that students who took more extensive notes and who engaged with the text better learnt more terms. Pedagogical implications for subject and LSP teachers are discussed.

1. Introduction

Because of the increasingly important status of English worldwide, learning the language is rapidly becoming an aim, if a secondary one, of many university courses around the world. Typically, English proficiency is expected of the many students in Europe and in other parts of the world who attend courses in English instead of the local language. However, it is not only these students who are expected to learn English terminology. A growing number of students today attend parallel-language courses (Josephson 2005), in which they listen to lectures given in their local language, but read textbooks written in English (Graddol 2006, Kuteeva 2011). These students are primarily expected to learn terminology in their L1. However, the secondary objective of many of these courses is also the acquisition of terminology in English (Pecorari, Shaw, Irvine, Malmström and Mežek 2012), so these students are expected to acquire bilingual scientific literacy in their L1 and English (Airey and Linder 2008). Consequently, as the subject-specific terminology taught in the lectures is often in the local language, they are usually expected to learn new English terminology from their reading only. How students read English texts and learn terminology from them is, therefore, of interest to both subject teachers and teachers of language/English for specific purposes (LSP/ESP). In this article I investigate the relationship between reading and the learning of English

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terms of Swedish students, with a specific focus on the students' note-taking strategies.

Learning subject-specific terminology in L2 differs from learning the more general L2 vocabulary. In acquiring a new word, technical or otherwise, the learner needs to learn the word's form, meaning, and its use (Nation 2001). In some cases, such as with much low-level vocabulary, learners are able to map the form of the word onto a meaning which already exists in their L1 (Jiang 2002, 2004). In other cases, the learner also needs to acquire the new meaning as well. This is predominantly the case when it comes to learning subject-specific terminology. Students learning terms in a subject area new to them do not only have to learn a new form; the concept is often new to them as well. Subject-specific vocabulary is thus a "part of a system of subject knowledge" (Chung and Nation 2004: 252) acquired in connection with that new subject knowledge, both of which are, when learnt, integrated into the learner's pre-existing knowledge (Koda 2005).

In order for teachers to be able to offer adequate LSP instruction to students, we need to know how students learn subject-specific terminology in L2. One way of investigating this is to study the students' reading notes, as these provide insight into how they understand the text and the strategies that they employ to learn the new terminology. Note-taking while reading to learn is a very common practice among students (Hedgcock and Ferris 2009), which has been proven to predict test success in several studies (Peverly, Brobst, Graham and Shaw 2003, Peverly and Sumowski 2012). Taking notes promotes deep understanding (Williams and Eggert 2002), since it involves several processes: comprehension, selection, and production (Piolat, Olive and Kellogg 2005). To take notes successfully, students thus first need to understand a text, after which they need to be able to select information relevant to their learning goal. Subsequently, they need to transform that relevant information into a format that makes the content of their reading easily accessible and comprehensible to them. Notes can thus provide valuable information about how students attempt to learn and what part of the body of content they understand.

Various factors associated with note-taking have been shown to affect learning positively. One of these factors is the amount and type of notes that students take and do not take. Students perform better on tests if they take more notes (Kiewra and Benton 1988, Peverly et al. 2003,

Song 2011). They tend to remember more of the content of a lecture or a text if they take copious notes in terms of the number of words or propositions. They also remember more details and outperform non-note-takers on tests if they note more high-level ideas (Peverly et al. 2003).

How notes are formulated has been shown to affect learning success as well. Some studies have looked at the language of notes and analysed them based on how close they were to the original text (Piolat, Olive and Kellogg 2005, Stefanou, Hoffman and Vielee 2008). Stefanou, Hoffman and Vielee (2008) looked at what proportion of student notes was a verbatim copy, a paraphrase, or the student's own contribution. They found that, unlike students who copied or paraphrased information from the lecture, those who related it to their own ideas performed better on the test following the lecture. Their findings suggest that students whose notes contained unique ideas achieved a deeper understanding of the content, because they were able to draw conclusions that their peers who mainly used verbatim copies and paraphrases were not able to.

The closeness of notes to the original text (e.g. lecture) may be connected with the comprehension of the content. Students have claimed that they use verbatim copies "to ensure fidelity of what was said by the teacher", and paraphrases "to ensure that they understood the teacher's explanations" (Bonner and Holliday 2006: 797). Similarly, in the context of assessment writing, students have explained that "sometimes when you paraphrase something, you just miss the point of the book" (Pecorari 2008: 104). These examples suggest that students might use verbatim copies when they are unsure they have understood the content, and paraphrases when they do understand. The closeness of notes to the source text may, therefore, indicate whether the students understood the text and perhaps even whether they have reached a deeper level of understanding of the content.

However, understanding of the content in part depends on the time the students have available to process the content. In L2 lectures, where time is very limited, students have reported that they mainly focus on writing notes and not on understanding (Airey 2009). Time is also a factor in learning from reading, as reading academic texts in L2 takes more effort and time, which results in students reading less (Pecorari, Shaw, Malmström and Irvine 2011). For these reasons, it is very important for students to use efficient procedures for learning during the limited time they have available.

Due to the number of students who are today learning from L2 texts, it would be useful to know what kinds of strategies these students employ. LSP teachers need to be able to help these students become more effective note-takers who adopt appropriate strategies for the time they have available. Studies of student notes have, however, primarily focused on note-taking strategies from lectures (Kiewra and Benton 1988, Song 2011, Stefanou, Hoffman and Vielee 2008). Fewer studies have investigated the effects of notes on learning from reading (Peverly et al. 2003, Peverly and Sumowski 2012). In particular, studies of L2 students' note-taking strategies have mainly focused on listening and not on reading comprehension (Carrell, Dunkel and Mollaun 2004, Clerehan 1995, Song 2011). In addition, previous studies all explored the effects of note-taking strategies on the learning of the general content in the oral or written texts, and not on the specific goal of learning terminology. The effect of students' note-taking strategies for the increasingly important task of learning L2 terminology from written texts has thus not yet been investigated.

2. Research questions

This article will explore the relationship between reading, note-taking strategies, and the learning of English terms of Swedish students. More specifically, it will focus on answering the following questions:

1) What are the note-taking strategies of students learning L2 subject-specific terminology from reading?
2) Are different strategies used for different vocabulary items?
3) Do the strategies of successful and unsuccessful learners differ?

3. Methods

3.1 Participants

The participants in this study were undergraduate students at a major Swedish university who were in their first term of English studies. One hundred and eighty-one (181) students took part in the experiment, which was a part of a larger study. A majority of the students (56%) were 21 years old or younger. Almost half of the students (48%) were new to

university studies and 27% of students reported being bilingual in Swedish and another language. This sample is representative of students at this institution studying this particular subject. Students were aware that participation was voluntary.

3.2 Materials

This experiment was a part of a larger study exploring the learning of subject-specific terminology in the parallel-language environment (e.g. Pecorari, Shaw, Irvine and Malmström 2011, Pecorari, Shaw, Malmström and Irvine 2011, Pecorari et al. 2012). The entire experiment consisted of several parts. Students read an English text on the subject of rhetoric and listened to a short lecture on the same topic in Swedish. The reading text presented fifteen terms, ten of which were also introduced in the lecture. In other words, five terms were in the reading only. The students were tested on the terms at three points: before the reading and listening event, immediately after, and after a delay of one week. They were free to take notes on the reading sheet or on a separate sheet of paper which was collected before the immediate post-test. They only had access to the reading text while reading. As this study focuses on the note-taking strategies of students learning terminology from reading, the data considered here are those notes taken on the terms which were presented only in the reading.

3.2.1 Reading text

The reading passage was a textbook-like introduction in English to rhetorical devices (see Appendix 1). The text was 885 words long and students were given 15 minutes to read it, after which time they were asked to stop reading. They were instructed to learn the terms in the text using their usual learning strategies. Participants were instructed to read as much of the text as they could, and, in the event that they did not finish reading, to mark the point at which they had stopped reading when time was called.[1]

[1] It is important to note that while all of the students who made a mark in the reading text can be supposed to have read less than all of the text, those who made no such marks could include some who read the whole text and some who did not follow instructions.

The first paragraph of the text was introductory; the rest of the text was dedicated to terminology. The rhetorical terms were grouped into five groups of three related terms, each group in a paragraph of its own, and each group including one term which was in the reading only. Every term group was introduced with a reference to the shared group characteristics. After that, the specific rhetorical figures were elaborated on. Each term was given approximately similar treatment. Each was defined and exemplified with two to three examples of the rhetorical figure, and every description also included some additional details. For example, *antimetabole* was described in a group of figures "relying on repetition" (term group characteristic). It was described as "involving presenting terms in one part of a sentence and reversing them with the same grammatical function in another" (definition) and exemplified with a famous quote by John F. Kennedy (detail): "Ask not what your country can do for you, ask what you can do for your country" (example).

In the order of presentation in the text, the terms focused on in this study are: *oxymoron*, *prozeugma*, *antimetabole*, *parrhesia*, and *paramythia*. For details of these terms, see the reading text (Appendix 1).

3.2.2 Immediate post-test

This fifteen-minute test was taken directly after the learning events. It consisted of a portion asking participants whether they recognised words and a multiple-choice component testing their ability to match the fifteen terms in the text with their definitions. Since in the target situation the language of instruction is usually Swedish, even though knowledge of terms in English is expected, the students were given a definition of a term in Swedish, and a choice of four terms in English, one of which was the correct answer. The students received one point for every correct answer. The maximum score for this study was five points.

3.3 Analysis of student notes

The reading passage and notes pages with any notes the students took during the reading and the lecture were collected before they took the knowledge test. The notes were analysed according to the quality and type of information the students had taken notes on (selection), and how they transformed that information into note format (production). The

analysis thus focused on two aspects of notes: (i) the types of information the students included or excluded from the notes, and (ii) the level of language transformation of the original text into note form. The categories of analysis for the two aspects emerged from the data under the guidance of categories in previous studies.

The types of information the students noted were the following: 'general information on rhetoric', 'term', 'term group characteristics', 'definition', 'example', and 'detail'. These are defined and exemplified in Table 1.

Table 1. Categories for the analysis of types of information given

Category	**Definition**	**Example**
General information on rhetoric	Any information found in the introductory paragraph of the reading text	Study of using language → ancient Greeks & Romans Rhetorical skills
Term	The name of rhetorical figure	antimetabole[a]
Term group characteristics	The characteristic the entire group of terms have in common as specified in the reading text	repetition
Definition	An explanation of the rhetorical figure (e.g. what it does, how it is structured)	presenting reversing
Example	An example of the rhetorical figure	ask not
Detail	Additional information found in the reading text which was not necessary for the understanding of the term	JFK

a. Student's example: *antimetabole = repetition, presenting reversing (JFK ask not)*

The notes were also analysed according to the strategies used to transform the language of the source text. Categorising the relationship between two texts is inherently problematic. For this reason, some research on source use has simply counted words in common rather than establishing categories (Pecorari 2003, 2008), and some of the previous research on notes limited the strategies to verbatim copying, paraphrasing, and students' original ideas (e.g. Stefanou, Hoffman and Vielee 2008). This analysis, however, used several categories to be able to distinguish between levels of transformation. The categories are defined and exemplified in Table 2.

Table 2. Categories for the analysis of transformation from the original text to note form[a]

Category	Definition	Example
Zero transformation: Verbatim copying	Word-for-word copy of lexical words or sequences from the reading text	**one verb working in several clauses**
Non-lexical additions	Addition or change of non-lexical words (articles, prepositions, etc.) which do not add new meaning	one verb working in several clauses **but** with different meaning
Close transformation	Transformation of a text by changing the word class or grammar, abbreviating, using symbols	**concentration** **use** (**1** verb) **diff mean**
Rephrasing	Rewriting the text using the students' own words (e.g. synonyms)	using one verb **to function** in **multiple** clauses
Translation	Direct translation or the rephrasing of the English text into another language	**samma verb olika mening** *[translation: same verb different meaning]*
Original ideas	Students' own unique ideas not found in the text	combined diff. meanings… w/ verb… **collocation?**

a. All examples below are transformations of: *[...] a concentrated style by using one verb working in several clauses of a sentence often with a different meaning [...]*. The text transformed using the transformation strategy in question is marked in bold.

At the top of the table are 'zero transformation' ('verbatim copying') and 'non-lexical additions', which are strategies where the changes to the language of the original text are non-existent or minimal. The strategies which follow, 'close transformation', 'rephrasing' and 'translation', all involve more originality and effort on the part of the student, as the changes are more substantial, although still primarily based on the original text. Last in the table is the category of 'original ideas', which is the most advanced transformation of the text, as the student establishes and notes connections not specified in the text. Important to note here is that in some of the cases, including the examples given in Table 2, students used several strategies to transform one piece of text.

The results of the analysis of note-taking strategies were used to determine the strategies students used in general and for different terms. Their strategies were also correlated with performance on the knowledge test.

4. Results

A large majority of students (87%) who participated in this study took notes during reading. The others chose not to take reading notes and instead only read or occasionally underlined words in the reading text. Almost all note-takers wrote their notes on a separate piece of paper; only four students wrote all or a part of their notes in the margins of the reading text, and a small percentage of note-takers (13%) both took notes and underlined words in the reading text. The notes on the rhetorical terms focused on in this study were fairly brief. On average, student notes on the five terms were only twenty-four words long.

4.1 Selected types of information

Not all students who took notes copied the term they read about. For example, while some students took notes on *oxymoron*, the actual word *oxymoron* did not feature in their notes. On average, students took notes on four (4.08) of the five terms investigated, noting a variety of information about them, with definitions and examples most common (see Table 3).

Almost all (96%) of the students noted definitions at least once, with the average student noting definitions for over three terms. Seventy-three per cent (73%) of students wrote examples with an average of 2.14. Other types of information were less common. Only twenty-four per cent (24%) of students noted term group characteristics, so this type of information was overall rather uncommon.

Table 3. Percentage of students (n=158) using the given type of information, and the mean number of terms described using this type of information

Definitions	% students	96
	M n terms	*3.41*
Examples	% students	73
	M n terms	*2.14*
Term group characteristics	% students	24
	M n terms	*1.32*
Details	% students	15
	M n terms	*1.08*
General information on rhetoric	% students	11

Very few students also noted details (15%) and general information on rhetoric (11%), probably because they had been told that the terminology would be the focus of the test. The students, therefore, chose definitions and examples as the types of information which they believed would help them learn the rhetorical terms. However, both a definition and an example were rarely given for the same term. On average, only one term (1.04) in the whole set of a student's notes would receive both. Examples of the three most common types of notes in this study are in (1)-(3).

(1) parrhesia = being to direct/insult[2]
Definition only
(2) sweet pain – oxymoron
Example only
(3) paramythia – expressing consolation encouragement
"tomorrow is another day"
Definition and example

4.2 Transformation strategies

Even though the students were writing in their second language, almost all of them wrote the notes in abbreviated form. Only two students used complete sentences when describing terms (example (4)); the rest wrote the name of the term and then either inserted a symbol, empty space, or similar, to separate it from the description of the term, as shown in, for example, (1)-(3) in the previous section.

(4) Prozeugma is when one verb can be implied in several clauses.

Students used a variety of strategies when taking notes and they often mixed them. Table 4 shows the percentage of students who used specific strategies when transforming the text into their notes. The most common strategy was zero transformation (verbatim copying). The shortest sequence was one word long, and the longest twenty-one words. Almost all students used this strategy in their notes, which usually consisted of copying the text word-for-word from the reading text and sometimes removing some of the non-lexical words, such as articles.

[2] All examples given in the article are the students' own writing and no changes have been made to them.

Table 4. Percentage of students (n=158) using transformation strategies

	% students
Verbatim copying	98
Close transformation	75
Rephrasing	46
Non-lexical additions	35
Original ideas	21
Translation	14

The second most common strategy was to transform the text so it still closely resembled the original.

(5) Parrhesia – too **rude** or **direct**.
*[original: too **directly** or **rudely** insulting]*
(6) **1** verb → several clauses → prozeugma
*[original: **one** verb **working in** several clauses]*

Many students changed the word class or the grammar, as shown in (5) where the student changed the adverbs ('rudely', 'directly') into adjectives ('rude', 'direct'). Almost all of these students also used symbols to replace words or to transform the syntax of the text, which is something that has previously been pointed out as a very common strategy (Piolat, Olive and Kellogg 2005). Example (6) shows the use of arrows. Abbreviated words were generally less common than transforming syntax, as only about a half of these students used them in their notes.

Other strategies were used by fewer students, but still fairly common. The strategy of rephrasing the text and using their own words was used by about a half of the students (46%) and non-lexical additions by about a third (35%). These strategies were typically used in connection with others, as in (7), where it is shown how a student rephrased a part of the sentence ('playing with the order of words [. . .] the meaning'), used a close transformation ('to reverse') and then copied the last half of the sentence verbatim ('with the same grammatical function').

(7) Antimetabole → **Playing with the order of words** to reverse **the meaning** / with the same grammatical function.
[original: presenting terms in one part of a sentence and reversing them with the same grammatical function in another]

Writing original or unique ideas was a strategy which not many students employed. Only thirty-three students (21%) noted any original ideas. These were usually student attempts to further narrow the definition as in (8), or the students' own examples, such as (9).

(8) Oxymoron – opposition **but not love-hate**
(9) Paramythia – [. . .] **It's not u, its me**.

Only five students provided a mnemonic device. For example, in (10) the student connects the entire form of the term to a detail found in the original text. The student wrote that 'Kennedy' (detail), who was known to use *antimetabole* and whose famous quote was given as an example in the reading text, 'can't' (anti-) 'metabolize' (-metabole) 'anymore'. In this way the student connected the form of the term to the detail and even to the example given in the reading text, even though the student did not write it down.

(10) antimetabole = Kennedy can't metabolize anymore cuz he's dead

More students used formatting only for clues to the meaning of the term. For example, some students underlined 'moron' in *oxymoron* and wrote *antimetabole* as 'anti-metabole'.

Only twenty-two students (14%) chose to take some of their notes in a language other than English, perhaps surprisingly given that only six self-reported English as a first language. All of the non-English notes were in Swedish except for one in German and one in Spanish. Only two of the students who took notes in a language other than English took the entirety of their notes in one language, while others instead mixed the two languages. For example, they would write a definition in Swedish and the example in English, as in (11), or they would write descriptions of terms in two languages, such as in (12), or sometimes vary the language from term to term.

(11) prozeugma = **mening med två motsättningar**
He took a drink and photo…
[translation: sentence with two contradictions]
(12) (sweet/pain) mutually contradictory terms = oxymoron (**ta bort mening genom motsats**)
[translation: remove meaning through contradiction]

4.3 Note-taking strategies for different terms

As has been mentioned before, not all students took notes on all terms. Table 5 shows that some terms were noted by a higher percentage of students than others. The percentage correlates with the position of the term in the text. *Oxymoron*, which was at the beginning of the text, was written down by most students (90%), whereas *paramythia*, which was at the end of the text, was noted by 56% of the students. Thus the further into the text the term was, the fewer students copied it and made notes on it, possibly because they were running out of time or because their interest was waning.

The note-takers used different strategies for different terms (Table 5). From a complex pattern, two things stand out when it comes to the types of information the students wrote.

First, the further into the text the term was, the fewer students cited examples for it, probably because they were running out of time. Second, apart from examples, the information type strategies (such as definitions, etc.) were used by a similar percentage of students for all terms except *antimetabole*. For *antimetabole*, a smaller percentage of students wrote definitions; instead, the percentages of students writing term group characteristics and details were higher than for the rest of the terms. The cause of this could be that the term group characteristic (‘repetition’) and detail (‘John F. Kennedy’) were more familiar to the students than the term’s fairly long and complex definition, so more students relied on them instead of on the definition.

Some language transformation strategies were also used by similar percentages of students for all terms, such as verbatim copying which was the most popular, and translation and original ideas which were on average used by the smallest percentages of students. However, the percentages of students using the other transformation strategies were different for different terms.

Table 5. Percentage of students (n=158) using strategies for individual terms (in the order of their appearance in the source text)

		Terms				
		oxy	pro	anti	parr	para
Students writing term	n	142	137	132	120	89
	%	90	87	84	76	56
% n noting type of information	Definitions	84	88	67	90	92
	Examples	53	45	36	33	25
	Term group characteristics	3	1	24	8	3
	Details	1	1	16	3	0
% n using transformation strategy	Verbatim copying	91	91	83	86	80
	Close transformation	18	37	37	40	30
	Rephrasing	6	31	33	12	11
	Non-lexical additions	6	22	16	5	2
	Original ideas	8	10	8	3	10
	Translation	6	9	10	7	10

For example, close transformation was used by a significant percentage of students for all of the terms but *oxymoron*. Apart from this, the percentages of students who used the different strategies for *oxymoron* were fairly similar to *parrhesia* and *paramythia*. The difference in the use of close transformation could be explained by the fact that in *oxymoron* the definition and examples were two-word phrases which many students could quickly write using only the strategy of verbatim copying, whereas in *parrhesia* and *paramythia* they were more complex. These types of text characteristics may also be the reason why a higher percentage of students used non-lexical additions and rephrasing in *prozeugma* and *antimetabole*, which had complex and long definitions. Student strategies therefore appear to be steered by individual characteristics of the material to be learned.

4.4 Post-test results

The experiment was designed to present participants with terminology which was new to them, and indeed the pre-test showed that informants had a very low level of knowledge of the terms to start with. In general,

neither the note-takers nor the non-note-takers performed particularly well on the post-test. On average, both groups were able to correctly match the definition and term of fewer than two rhetorical figures (see Table 6).

Table 6. Post-test results (max=5)

	n students	% all students	Average test score (SD)
All students	181	100	1.87 (1.47)
Notes	158	87	1.87 (1.46)
No notes	23	13	1.87 (1.55)

Nevertheless, a notable difference could be observed when comparing the distribution of students among scores. As can be seen in Figure 1, the percentage of note-takers who achieved the scores zero to three points did not vary (20-23%), whereas a much larger percentage of students who did not take notes achieved one point (43%), and a very small percentage achieved three (4%). When it comes to the top scores (4-5 points), the students who did not take notes performed slightly better than the note-takers. However, as the standard deviations of both groups are fairly similar (1.46–1.55), this difference between the groups is not significant. The result of a chi-square test, as well, means that a similar conclusion needs to be drawn (χ^2 (5, N=181) = 10.28, p=.07). These results can only be suggestive though. The range of the test was very small (0-5 points) and the group of non-note-takers was small as well (23 students). The Shapiro-Wilk test of normality showed that neither of the groups of students have a normal distribution (note-takers p=.000; non-note-takers p<.01), so parametric tests cannot be used. These differences, therefore, should not be taken as significant, but only as suggestive.

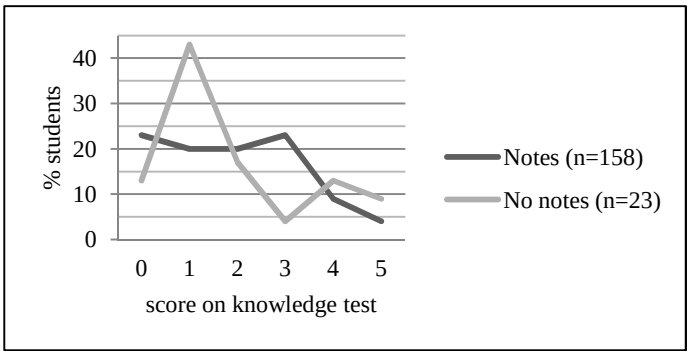

Figure 1. Percentage of note-takers and non-note-takers achieving a particular score on the knowledge test

Low knowledge test scores might be due to the limited reading time. The students were instructed that if they did not complete the reading passage, they should mark in the text where they stopped reading. None of the non-note-takers made any such marks. On the other hand, twenty-nine (18%) of the students who took notes marked in the text where they stopped reading, the large majority of whom (20 students) were those who achieved zero or one point. In addition, there were also many note-takers who visibly changed their note-taking towards the end of their notes. Some students (20%) stopped taking notes for the terms found towards the end of the text, and some (6%) who took notes throughout their reading underlined information in the reading text only at the beginning of it. Many students, therefore, either did not manage to read the entire text, or took less thorough notes towards the end of their reading.

A comparison was done between the post-test scores of note-takers who marked in the text that they did not manage to read all of the text, and the note-takers who did not make any such marks. The result of comparison between the two groups shows that those who did not make any such marks learnt 41% of the terms they managed to read about, whereas the note-takers who did not finish their reading only learnt 30% of the terms they could find in the text marked as read. This suggests that perhaps those who read the entire text were not only faster readers, but also better learners.

Each of the five terms was learnt by 34-43% of the students. However, there was a difference between note-takers who wrote notes

for certain terms and those who did not. For the first two terms, both the students who took notes on the two terms, and those who did not, performed equally well on the questions about them. It was for the last three terms that there were big differences. Almost half of the note-takers who took notes (44%), but only 15% of those who did not take notes on the final three terms answered correctly. What this means is that at the beginning of the reading the students were probably very attentive to what they were reading, regardless of whether they wrote notes for those terms or not. Taking notes while learning terms at the beginning of the text therefore did not prove to be an effective strategy, as not taking notes proved to be just as effective. Towards the end of the reading, however, the note-takers who did not write notes for those terms were affected negatively. This, again, could be an effect of time. Some students marked in the text where they stopped reading because they ran out of time, so they were unable to learn all of the terms. Some other students who did not make a mark in the text perhaps instead stopped being attentive and taking notes when they started running out of time and, consequently, also did not learn all of the terms.

4.5 Strategies of successful and unsuccessful learners

In order to be able to compare the strategies of successful and unsuccessful learners, the students were grouped according to their knowledge test score. Students who scored zero or one were deemed to be unsuccessful learners on this multiple-choice test. Those who received two or three points were classed as intermediate learners, and those who achieved four or five successful learners.

There were some differences between the three groups of learners and the types of information they noted (Table 7).

The first difference is that on average the successful learners copied almost all terms in their notes (4.57), whereas the unsuccessful wrote fewer (3.78), and, consequently, learned fewer of them (see Section 4.4). Thus it seems that unsuccessful learners achieved low scores due to their low-quality reading/learning, and possibly also slow reading. Second, while the percentages of students noting definitions were similar (95-97%), unsuccessful learners noted this type of information for fewer terms. On average, they wrote definitions only for three terms out of five, whereas the successful learners wrote them for four. A higher percentage

of successful learners (86%) than unsuccessful learners (75%) also used examples. In addition, successful learners also used both a definition and an example slightly more often (*M*=1.29) than the intermediate and unsuccessful groups of learners. The group of intermediate learners was typically between the two groups, with a few exceptions. A noticeably smaller percentage of these students wrote examples and notes which touched on the characteristics of the entire group of three terms rather than one specific term. In short, all students usually chose to note only one type of information for each term, although this was especially true for the group of unsuccessful learners.

Table 7. Percentage of students from three learner groups using the given type of information, and the mean number of terms described using this type of information

		Points on the knowledge test		
		0-1	2-3	4-5
	n students	69	68	21
Terms written in the notes	average	3.78	4.24	4.57
Definitions	% students	96	97	95
	M n terms	*3.06*	*3.55*	*4.10*
Examples	% students	75	66	86
	M n terms	*2.10*	*2.22*	*2.06*
Term group characteristics	% students	25	22	29
	M n terms	*1.29*	*1.20*	*1.67*
Details	% students	13	16	19
	M n terms	*1.11*	*1.09*	*1.00*
General information on rhetoric	% students	14	7	10

There were some differences in the types of transformation strategies different groups of learners used (see Table 8).

Table 8. Percentage of students from three learner groups using the given transformation strategy

		Points on the knowledge test		
		0-1	2-3	4-5
	n students	69	68	21
% n using transformation strategy	Verbatim copying	96	100	100
	Close transformation	64	84	81
	Rephrasing	39	49	62
	Non-lexical additions	35	35	33
	Original ideas	25	16	24
	Translation	14	10	24

A higher percentage of successful learners than unsuccessful learners used close transformations, in particular abbreviations. More of them also used rephrasing and translation. The detailed data show that these differences are also reflected in the types of information noted. The successful learners used the higher-level strategies, such as rephrasing, for the least frequently recorded information types, general information on rhetoric, details, and term group characteristics. Writing about term group characteristics might thus make for deeper learning, which has been shown in other studies, where noting high-level ideas lead students to achieve better results on tests and to draw their own conclusions (Peverly et al. 2003). Similarly, successful learners were more likely to change and abbreviate examples and definitions than the less successful learners.

Interestingly, in some instances, the intermediate learners deviated from the position between the unsuccessful and successful learners here as well. As can be seen in Table 8, a smaller percentage than the unsuccessful and successful learners used a language other than English and noted their own original ideas. On the other hand, a slightly higher percentage of them used close transformation.

5. Discussion and conclusion

This study investigated note-taking strategies of Swedish students and how these affected their learning of English terms from reading. The strategies which were investigated included taking or not taking notes,

the type of information the students chose to note, language transformation strategies they chose the employ, and strategies for different vocabulary items. These different strategies were then also related to the students' test scores.

The first research question sought to explore the note-taking strategies of students who are learning L2 subject-specific terminology from reading. The analysis of notes focused on what the informants selected to write in their notes, and how they transformed that selected information into note format. The results show that most informants selected definitions and examples to help them learn the terminology. Fewer informants noted general information on rhetoric, details, and term group characteristics, which could be one of the reasons for the general low scores on the knowledge test, as macropropositions, such as term group characteristics in this study, have been shown to scaffold students' knowledge and help them retrieve lower propositions (Peverly et al. 2003). Few students also used the higher-level language transformation strategies such as rephrasing, translation and original ideas. Instead, many students relied on zero transformation (verbatim copying) and making slight changes to the language (non-lexical additions and close transformations). As using higher-level transformation strategies can contribute to understanding of the text (Howard, Serviss and Rodrigue 2010), and consequently also learning of the content, students' choice of transformation strategies may be thought to have contributed to the poor learning of terminology under time pressure as well.

The second research question explored whether students used different strategies for different terms. The nature of notes for different terms was affected by the position of the term in the reading text and probably by the language, complexity, and length of the term description. The position of the term in the text affected how many students wrote down terms and examples; fewer students noted terms and wrote examples for the terms at the end of the reading text than for those at the beginning. The position of the term, therefore, did not only affect the likelihood of the student writing notes on the term, but also the likelihood of the student writing examples. Language and complexity of the term description in the reading text also affected student strategies to some extent. Terms with longer and more complex descriptions were often described using several language transformation strategies, and

term descriptions with words more familiar to the students tended to be described with verbatim copies or close transformations. Students thus used different strategies for some of the terms, depending on the characteristics of the term description. To my knowledge, this type of interaction between text characteristics and note form has not been reported previously. The students, therefore, acted strategically and did not only perform routines. However, due to low scores, it is unclear how much these different strategies for different terms affected the learning of these terms.

The comparison of unsuccessful and successful learners (research question 3) produced findings which, as noted in Section 4.4, are not statistically significant but can be considered indicative of a trend. The findings suggest that certain strategies were used by more of the successful learners than the unsuccessful learners. First of all, successful learners tended to write notes on more of the terms than the unsuccessful learners, and their notes differed in quality as well. The notes of successful learners had more definitions and examples, and more of them also used the higher-level language transformation strategies such as rephrasing, translation and original ideas. Quantity of notes, such as the number of terms described in the notes and the number of definitions and examples, therefore, contributed to learning, which has been shown in other studies as well (e.g. Peverly et al. 2003, Song 2011). Quality of notes, such as transforming the language of the original text into your own, also appeared to contribute to learning, probably due to the students' higher engagement with the text.

The students who did not take notes on average achieved similar scores on the knowledge test as note-takers, which has not been the case in other note-taking studies (e.g. Peverly et al. 2003, Peverly and Sumowski 2012). As in some L2 reading research (e.g. Shaw and McMillion 2008), one major hindrance to students in this study achieving high scores appeared to be time. Timing affected whether students took notes on terms or not, so lower percentages of students took notes on terms which were further into the text. Non-note-takers did not mark that they were unable to read through the entirety of the text, whereas some note-takers did. A possible explanation for this could be that they did not manage to read the entire text because they were slowed down by note-taking. In this sense, high achieving students who did not take notes more correctly judged the task and, consequently, adopted a

more effective strategy for learning than the note-takers who were unable to finish reading the text, such as the group of unsuccessful learners where almost a third of them marked that they were unable to finish reading the text.

Time also affected the intermediate group of learners, who learnt two or three terms. In this group, only some students acknowledged that they were unable to finish reading the text, so they on average managed to take notes on more of the text that the unsuccessful learners. However, the strategies this group used did not always fit into the expected pattern. Some strategies were in fact used by a lower percentage of intermediate learners than unsuccessful learners. A lower percentage of intermediate learners wrote examples and used higher-level transformation strategies such as translations and original ideas. What this means is that the quality of the intermediate learners' notes was in some respects lower than those of the unsuccessful learners. Thus while unsuccessful learners took notes on fewer terms, they used some of the strategies which have been shown to contribute to learning more than the intermediate learners. In other words, the notes of unsuccessful learners were of higher quality, but lower quantity, whereas the notes of intermediate learners were of higher quantity, but lower quality. If the students consciously chose this strategy, perhaps this could be interpreted as intermediate learners attempting to read through more of the text and sacrificing some of the quality for quantity, which is something students expected to read in L2 may find themselves doing, given the limited amount of time they are willing to devote to study reading (Pecorari, Shaw, Malmström and Irvine 2011).

In conclusion, my findings show that, in this study culture, a large majority of students learning from reading take notes, even when they will not be keeping them. Note-taking can, therefore, be seen as not only a device for future reference, but also as a learning strategy. Student note-taking strategies are affected by several factors. First, the strategies the students use depend on the characteristics of the student: degree of engagement with the text, depth of understanding, and the student's assessment of the task. Second, the strategies are affected by the characteristics of the task and text: the time available for reading, and conceptual and linguistic complexity of the text. The results also confirm that the quantity and quality of student notes affect the success of learning subject-specific terminology in L2. Students who write more

complete notes with descriptions of more of the terms and their characteristics, especially the high-level ideas such as definitions, are more likely to learn the terms. Students who use note-taking strategies focusing on deeper engagement with the text, such as reformulating descriptions of terms into their own words, also remember more subject-specific terminology in L2. The different strategies students employ, however, are probably less affected by the characteristics of the different terms and more by how quickly the students are able to read.

The pedagogical implications following from this study are that content and LSP teachers should teach students note-taking strategies. However, it is important to highlight that reading and lectures are very different situations particularly in L2, and require different strategies and teacher advice. Teachers need to teach students how to adjust their note-taking and reading strategies to the reading/learning conditions, as well as their personal learning style. It is important that the students are aware of the trade-off between time and reading quality, so that they are able to make informed decisions about whether to take notes or not, as they may sometimes actually benefit from not taking notes. Teachers should also encourage their students to take the time to read through the entire text and to take extensive notes on all of the content they need to learn (e.g. Kiewra and Benton 1988, Peverly et al. 2003). They should especially focus on the advantages of noting the high-level ideas (Peverly et al. 2003), which are, as in this case, usually signaled by the structure of the text and topic sentences. Furthermore, as shown in this study, there is a tendency for notes to be limited to the areas covered by the text, with relatively few students using their notes to relate the topic of the reading to ideas and experiences that form part of their prior knowledge. Given the beneficial effects of making such connections (Stefanou, Hoffman and Vielee 2008), students should be encouraged to make them using their own words, as using their own words may contribute to their better understanding of the text (Howard, Serviss and Rodrigue 2010). Using their own words is likely to imply a greater use of L1, in contrast to much earlier note-taking advice. Students manifestly need training in note-taking strategies if they are to go beyond the text by making connections to pre-existing knowledge.

While this study has investigated several different kinds of note-taking strategies, there are others which have not been investigated, but which could provide valuable insight into note-taking and learning (e.g.

linear and non-linear note-taking, visual elements, etc.). In addition, it should be noted that generalisation of the results of this study can be made for this study culture, and that students in other educational environments might approach note-taking differently than the Swedish students in this study. Future research should thus focus on other note-taking strategies, and aim to investigate and compare note-taking strategies of students in various educational environments.

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Appendix 1

Rhetoric: How language works

It's long been known that the way we formulate our thoughts helps determine the likelihood that our words will change the way people think, feel and behave. The study of using language to influence goes back at least as far as the ancient Greeks and Romans, who valued rhetorical skills, and developed a set of terms to describe language use, and the forms and functions of language.

Many of these terms describe figures of speech which people recognize easily, even if they don't know the term itself. We've all heard jokes based on the idea that some phrases, like *military intelligence* or *political goodwill* are contradictions in terms, or descriptions of love as *sweet pain*. Such mutually contradictory terms are called **oxymoron**. In slang and in poetry we want to make our language a bit more poetic and one way is to call something by the name of one of its parts, like calling a car *wheels*, or a new person *a new face.* This is called **synecdoche**. Another device we use every day is **litotes**; this term refers to expressions like *not undesirable* for something excellent, or *not unattractive* for a beautiful object, that is referring to something as if it was less than it really is.

Some of the rhetorical figures have to do with how sentences, clauses and phrases are put together, and these can often be used to refer to the style of various writers. When clauses are assembled without conjunctions (words like 'and' or 'but'), that's called **asyndeton**, as in Churchill's famous speech that went *We shall fight on the landing grounds, we shall fight in the fields and in the streets, we shall fight in the hills; we shall never surrender*. On the other hand, when long strings of clauses are created with conjunctions, that's called **polysyndeton**. The writer Ernest Hemingway was fond of this, with sentences like *I said, 'Who killed him?' and he said 'I don't know who killed him, but he's dead all right,' and it was dark and there was water standing in the street and no lights and boats all up in the town and trees blown down*. Many writers create a concentrated style by using one verb working in several clauses of a sentence often with a different meaning, like *She broke his golf-club and his heart* or *He took a drink and a photograph.* This kind of concentration is called **prozeugma**.

Many rhetorical figures rely on repetition. For example, John F. Kennedy was famous for saying *Ask not what your country can do for you, ask what you can do for your country* and a folk expression says *You can take the boy out of the country, but you can't take the country out of the boy*. That figure of speech, involving presenting terms in one part of a sentence and reversing them with the same grammatical function in another, is called **antimetabole**. A similar device is using the same word several times in different grammatical forms, which is called **polyptoton**, like in Brad Pitt's line from *Fight Club: The things you own end up owning you* or the joke *Working hard or hardly working?* Another familiar device is repetition of a common name with different functions: once to designate an individual and once to signify the qualities that the individual usually has: *boys will be boys*, *war is war*. This is called **diaphora**.

Some rhetorical figures are not examples of effective speech, but rather the opposite. For example, some people are keen to show off their learning and pepper their speech with foreign words and phrases. When this results in an unattractive mix of too many languages (*There's a soupçon of the Zeitgeist in his charisma*), it's called **soraismus**. Another bad feature that we quite often see in writing is **catachresis**, the use of a word in a context that differs from its proper application, like using *sight unseen* for a recording one has not listened to or using *infer* when you mean *imply*. **Parrhesia** is being too directly or rudely insulting, which might not be wise, as in the classic "yo' mama" jokes: *Yo' mama so old I told her to act her age and she died* or *Yo' mama so old that when she was at school there was no history class.*

Other rhetorical terms refer for things that a piece of text does, the functions it performs. **Mempsis** is expressing complaint and seeking help, something some of us recognize from scam emails from people who are in trouble and need our help to rescue their money or like a politician who needs our help to mend broken Britain. When a speaker expresses happiness or gratitude for good luck—or for the avoidance of bad luck—that's called **paenismus**, as in *How wonderful everything has been today* or *Thank goodness it didn't rain on the day of the picnic*. If a speaker expresses consolation and encouragement, saying things like *We're all with you and it's sure to get better* or *Tomorrow is another day* the term is **paramythia**. It may seem strange to give formal names to these ordinary functions of speech, but the ancient Greeks were, and

modern rhetoricians are, very keen to help us see through what politicians, or scam email writers, are doing to manipulate us.

Sources: Wikipedia and Silva Rhetoricae (http://rhetoric.byu.edu/)