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Master's Thesis:

The relationship between knowledge of English connectives and reading comprehension skills of Dutch secondary school students

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Abstract

Connectives form a special domain of vocabulary that shows the reader how text segments are semantically related to each other. Previous research has found that knowledge of connectives significantly contributes to the reading comprehension of L2 learners in a naturalistic setting. The present study aimed to find out whether this positive contribution of connective knowledge could also be found for foreign language learners in a formal setting. To do this, the reading comprehension and knowledge of English connectives of 50 Dutch havo-4 secondary school students was measured, along with the control variables vocabulary knowledge, word reading fluency, working memory, out-of-school language exposure and age of acquisition. A multilevel linear regression model showed that knowledge of connectives significantly contributed to reading comprehension above and beyond vocabulary knowledge. It was hypothesized that vocabulary knowledge would influence the contribution of knowledge of connectives to reading comprehension, however, no such influence was found. Participants received the same amount of benefit from their connective knowledge, irrespective of their vocabulary size. The results of this study have extended the unique contribution of knowledge of connectives to reading comprehension to a different learning context: instructed foreign language learning. Implications and suggestions for the educational practice are discussed.

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1. Problem and Relevance

Reading is an activity which students are confronted with on a daily basis. In secondary school, and later on in higher education as well, many learning activities involve reading texts. Good comprehension of these texts is crucial because little will be learned when only fragments of the texts are understood. Most texts that students encounter in their daily lives will be written in their first language (L1). However, as soon as they start learning a second language (L2) or foreign language, they will also be confronted with texts in that language. In the Netherlands, English is the most widely taught foreign language in secondary school. At the end of secondary school, havo-students are expected to be able to read English texts at CEFR-level B2 (upper-intermediate), and vwo-students at level C1 (advanced) (Fasoglio, De Jong, Trimbos, Tuin & Beeker, 2015). Programs in higher education in the Netherlands also often require students to read English scientific articles and use English textbooks. For many students, it is quite challenging to understand the English news articles, expository and scientific texts that they are assigned to read.

Research has shown that there are a number of factors and skills that can predict one's L1 and L2 reading comprehension, such as working memory, vocabulary knowledge and language decoding skills (e.g. Harrington & Sawyer, 1992; Van Gelderen et al., 2003; Melby-Lervåg & Lervåg, 2011; Jeon & Yamashita, 2014). Besides these variables, texts themselves are often constructed in ways that promote the reader's comprehension of the text. A good example of this is a special vocabulary domain called 'connectives'. Connectives are linguistic devices that facilitate the construction of a mental representation of a text because they function as processing instructions that tell the reader how different text parts are related (e.g. Sanders, Spooren & Noordman, 1992; Cain & Nash, 2011; Van Silfhout, Evers-Vermeul, Mak & Sanders, 2014; Welie, Schoonen, Kuiken & Van den Bergh,

2017). The connective ‘therefore’ in (1), for example, instructs the reader that the preceding clause is the cause of something that will follow after the connective. In other words, it informs the reader about the causal relation between the two text elements.

(1) It had been raining all morning. *Therefore*, it was decided to cancel the match.

Halliday and Hasan (1976) were one of the first to propose a categorization for connectives based on the kind of coherence relation they signal. Additive connectives (e.g. ‘furthermore’) indicate that more information is added, adversative connectives (e.g. ‘however’) signal contrasts, causal connectives (e.g. ‘consequently’) indicate cause-and-effect relations, and temporal connectives (e.g. ‘afterwards’) demonstrate the sequence of events in time. Besides these different functions, connectives also come from various grammatical categories, such as adverbs (e.g. ‘then’, ‘therefore’) and conjunctions (e.g. ‘since’, ‘although’) (Bordería, 2001; Evers-Vermeul, 2005). Some can even be idioms, of which ‘on the other hand’ is an example (Evers-Vermeul, 2005).

Research has shown that the presence of connectives in texts can improve L1 and L2 text comprehension (Degand, Lefèvre & Bestgen, 1999; Degand & Sanders, 2002; Cain & Nash, 2011; Van Silfhout, Evers-Vermeul & Sanders, 2013). As mentioned earlier, connectives show the reader how text elements are semantically related to each other. This allows for more rapid processing of sentences and explains why comprehension improves with the presence of connectives. Research has also found that knowledge of connectives significantly contributes to the improvement of L2 reading comprehension when other factors such as vocabulary knowledge, reading fluency and metacognitive knowledge are controlled for (Crosson & Lesaux, 2013; Welie et al., 2017).

Knowledge of connectives thus appears to be important for text comprehension in the L1 and L2. However, its effect on comprehension when reading in a foreign language has not yet been investigated. The studies by Crosson and Lesaux (2013) and Welie et al. (2017) focused on participants in an immersion setting; they lived in a country where the language they were learning (or had learned) was the official language. A language learner in such a naturalistic setting receives a large amount of input and has plenty of opportunities to use the language. Instructed foreign language learning, on the other hand, is characterized by a much more limited amount of exposure and opportunities for language use (Hummel, 2013). Moreover, there is often a large focus on linguistic rules, which are presented one-by-one, and feedback on language production is provided (Krashen, 1976).

The present study focuses on foreign language learning in a formal setting and investigates the impact of knowledge of English connectives on the reading comprehension of Dutch students who are learning English in secondary school. It investigates whether the findings of L2 connective-research can be extended to a different learning environment (instructed foreign language learning). Many regard connectives as processing instructions that tell the reader how text elements are related (e.g. Sanders et al., 1992; Cain & Nash, 2011; Van Silfhout et al., 2014; Welie et al., 2017). Some even argue that they can, therefore, be perceived as part of a learner's procedural knowledge (Zufferey, Mak, Degand & Sanders, 2015). Acquiring procedural knowledge, contrary to declarative knowledge, needs time and an enormous amount of exposure, which are both present in L2 acquisition in a naturalistic setting. Dutch students, even though they typically receive quite some out-of-school exposure to English, do not receive exposure to this extent. It is, therefore, less likely that Dutch students acquire English connectives as procedural knowledge. Rather, the limited exposure and available time could mean that connectives are treated as any other kind of vocabulary, and thus as declarative knowledge. Because this kind of acquisition differs from that in a

naturalistic (immersion) L2 setting, its impact can also be expected to differ. To shed more light on this matter, this study has also investigated the way in which connectives are treated in English coursebooks that are often used in Dutch secondary schools.

The insights gained in this research will be useful for the educational practice because they will demonstrate whether foreign language learners can also benefit from knowledge of connectives while reading in a foreign language. The findings will expand current scientific knowledge about foreign language reading comprehension and its influencing variables. A larger knowledge base for this subject could eventually lead to new suggestions for the teaching practice of foreign language reading in secondary schools.

The following chapter discusses different predictors of L1 and L2 reading comprehension and the influence of connectives on L1 and L2 reading. Chapter 3 presents the research question and hypotheses. The participants and testing materials used in this study can be found in chapter 4. Chapter 5 presents the results of the administered tests and conducted analyses. The final chapter discusses these results in relation to earlier studies, answers the research question and discusses limitations and directions for future research.

2. Theoretical Framework

2.1 The reading process

The reading process of a text can be considered successful when the reader has constructed a "coherent representation of the text's meaning" in his or her mind, and thus comprehends the text (Cain & Nash, 2011, p. 3). Kintsch (1998, as cited in Cain & Nash, 2011) refers to this representation of what the text is about as a situation model. The construction of a situation model takes place at several levels and units of language: the word level, sentence level, and text level (Perfetti, Landi & Oakhill, 2005). When the processes that take place at each level combined are successful, they result in a coherent representation of the text. Complications in one or several processes, on the other hand, can hinder successful comprehension for the reader.

2.1.1 Predictors of L1 and L2 reading comprehension

Research has shown that there are a number of predictors for both L1 and L2 reading comprehension. Jeon and Yamashita (2014) conducted a meta-analysis to provide an overview of the average correlations between L2 reading comprehension and certain variables associated with reading. Despite the focus on L2 comprehension in the analysis, the researchers mention that the examined variables have been proven to affect both L1 and L2 reading. The variables in the meta-analysis were divided into high-evidence and low-evidence correlates, or in other words: variables investigated frequently and less frequently. Some of the strongest predictors and their correlations with reading comprehension are described below.

From the high-evidence correlates, Jeon and Yamashita (2014) found that L2 grammatical knowledge (r = .85) and L2 vocabulary knowledge (r = .79) correlated strongest

with L2 reading comprehension. The relationship between vocabulary knowledge and reading comprehension has been well established over the years, both for L1 and L2 reading (Stanovich, 2000). For example, Stahl (1983) conducted research in which young students were divided into groups that received L1 vocabulary training, and a group that did not. The vocabulary instruction turned out to have a significant positive effect on vocabulary knowledge and L1 reading comprehension, thus showing that greater vocabulary knowledge improves comprehension. Van Gelderen et al. (2003) investigated both L1 and L2 speakers of Dutch and found that for both groups, vocabulary knowledge made a significant and unique contribution to reading comprehension. Moreover, grammatical knowledge was also found to contribute significantly to reading comprehension in both groups.

The variable metacognition, which included both metacognitive knowledge and metacognitive experiences in Jeon and Yamashita's (2014) study, correlated only moderately (r = .32) with L2 reading comprehension in the meta-analysis. However, Van Gelderen et al. (2003) investigated metacognitive knowledge (defined as knowledge of text characteristics and reading/writing strategies) and found that it contributed significantly to L1 and L2 reading. Subsequent research by Van Gelderen et al. (2004) replicated this result. An explanation for this contradicting outcome could be the fact that metacognition is quite a "complex and multifaceted construct" (Jeon & Yamashita, 2014, p. 170). The studies included in Jeon and Yamashita's (2014) meta-analysis might have defined this construct in varying ways, causing the average correlation with L2 reading comprehension to be lower than the one found in both studies by Van Gelderen et al. (2003; 2004), who used a clear definition of the construct.

Another high-evidence correlate that is claimed to influence reading comprehension is language decoding, which Jeon and Yamashita (2014) define as the conversion of letters to sounds and subsequently to language. It cannot be denied that language decoding skills are

important for reading comprehension. When the letters on the page cannot be decoded correctly into language, comprehension of the text will never occur. Therefore, language decoding skills can be regarded as the basic skills that are required to make reading possible. Moreover, when the decoding process is accurate and fast, more cognitive capacity will be left to attend to the meaning of the text, which will further improve comprehension.

When measuring decoding skills, one can look at the accuracy and efficiency of the decoding process. Jeon and Yamashita (2014) included studies investigating one or both of these factors in the meta-analysis. The correlation between L2 decoding and L2 reading comprehension was .56, which is quite a strong correlation. Jeon and Yamashita (2014) expected the correlation to be moderated by age because other studies have claimed that there is a certain threshold for the influence of decoding on comprehension; at a certain age, additional gains in decoding speed and accuracy no longer have a significant impact on comprehension (e.g. Thorndike, 1973-1974; Aarnoutse & Van Leeuwe, 1988, as cited in Van Gelderen et al., 2004). The results showed that there was no significant influence of age on the correlation between L2 decoding and L2 comprehension. Melby-Lervåg and Lervåg (2011) conducted a similar meta-analysis and found that L1 decoding and L2 reading comprehension correlated reliably. Interestingly, they also found that the correlation between the two variables was moderated strongly by the age of the participants in the samples used in the analysis; the correlation weakened when the age of the participants increased. This seems to suggest that, contrary to L2 decoding skills, there exists an age threshold for the influence of L1 decoding skills on L2 reading comprehension.

Van Gelderen et al. (2004) also investigated language decoding (L1 and L2) and used tests for word recognition speed and sentence verification speed to operationalize the variable. The researchers found correlations between the two test scores and reading comprehension in the L1 and L2. However, the two tested variables did not uniquely

contribute to L1 and L2 reading comprehension. This finding seems to indicate that the threshold mentioned earlier was reached in this study. The researchers mention that at a certain point in time, additional improvement of language decoding skills may no longer influence comprehension significantly. The participants in the study were 13 to 16 years old and can thus be assumed to have reached a sufficient level of decoding skills. This could explain why the differences in language decoding competence no longer made a significant contribution to comprehension.

Furthermore, a language-independent variable that has been found to correlate with reading comprehension is working memory (Jeon & Yamashita, 2014). While reading, a reader constantly has to link the successive stream of words and sentences together to form a meaningful representation of the text. The working memory can be considered a crucial element in this process because it enables the reader to access what has been read before so that it can be linked to the newly received information.

In a meta-analysis on working memory research, Daneman and Merikle (1996) found that working memory measures that tap both storage and processing capacity are good predictors of reading comprehension in the L1. The results of a study by Harrington and Sawyer (1992) showed that participants with larger working memory capacities scored higher on L2 reading tests than those with a smaller working memory. The variable thus appears to affect reading comprehension in both the L1 and L2. The correlation found in Jeon and Yamashita's analysis was .42, which indicates that the correlation was moderate on average in the included studies.

Finally, L1 reading comprehension can be considered another predictor of reading comprehension in the L2. Many researchers claim that some of the skills acquired for reading in the native language can be transferred to reading in an L2 and that the two, therefore, correlate (e.g. Cummins, 1979; Koda, 1988; Jeon & Yamashita, 2014). Decoding skills or

metacognitive knowledge, for example, are generally not language specific and can, therefore, readily be used while reading in an L2. In their meta-analysis, Jeon and Yamashita (2014) found that L1 and L2 reading skills correlated moderately (r = .50). Moreover, they found that L1-L2 language distance had a significant effect on the strength of the correlation; the correlation between L1 and L2 reading was significantly stronger when both the languages were Indo-European languages, compared to when one was Indo-European and one was not. The researchers perceive this as evidence for the occurrence of crosslinguistic transfer of reading skills when the L2 is linguistically similar to the L1. Van Gelderen et al. (2004) investigated the contribution of L1 reading comprehension to L2 reading comprehension and found that it was significant and substantial (β = .85). According to the researchers, the explanation for this strong contribution stems from the fact that the tasks used to measure L1 and L2 reading comprehension were kept as similar as possible to provide for the best comparison.

In sum, research has shown that vocabulary knowledge and grammatical knowledge contribute to both L1 and L2 reading comprehension. Some research also seems to indicate that metacognitive knowledge can significantly predict reading comprehension. Working memory and L1 decoding have been shown to correlate both with L1 and L2 reading comprehension. For L2 comprehension, the strength of the correlation with L1 decoding was found to be moderated by the age of the participants; as age increased, the strength of the correlation weakened. L2 decoding also correlated with L2 reading comprehension, however, no moderation of age was found between these two variables. Lastly, L1 reading comprehension in general has been proven to be a predictor of L2 reading comprehension, which is explained by the occurrence of positive linguistic transfer from the L1 to the L2. Moreover, research has found that the correlation is significantly stronger when the L1 and L2 are linguistically similar.

2.2 Connectives

Besides the predictors of reading comprehension mentioned earlier, knowledge of connectives could also be a variable contributing to comprehension. Connectives belong to a special domain of vocabulary that shows the reader how text segments are related, and thus help provide better comprehension of the text. Different studies have investigated the effect of (knowledge of) connectives on L1 and L2 reading comprehension. Some of these studies focus on the effect of connectives on the reading process, while others investigate the reading product (comprehension). There are also studies that have incorporated both angles in their design.

When considering the effect of connectives on the L1 and L2 reading process, a few hypotheses can be formulated. Firstly, it could be hypothesized that insertion of connectives in a text will increase the reading time, as more words will have to be read by the reader. On the other hand, because connectives instruct the reader how text parts are related, they could facilitate the construction of a mental representation of the text. Therefore, it could also be hypothesized that reading times will be shorter because the reader does not have to slow down or reread a sentence to understand its relation to other elements of the text. When it comes to the effect of connectives on reading comprehension, it could be hypothesized that comprehension will improve because relations within the text are made explicit, making it easier to understand the meaning of the text. Lastly, it could also be hypothesized that the effect of connectives will be smaller (or even absent) for the L2 reading process and comprehension in comparison to L1 reading. While reading, L2 readers can be expected to encounter a larger number of unknown words. When this is the case, knowledge of the meaning of connectives might not be of much help because the rest of the text is not understood clearly (Crosson & Lesaux, 2013). In addition, it is also possible that L2 readers dedicate most of their cognitive capacity to the direct translation of words and sentences, and

that they, therefore, do not have much capacity left to also attend to the textual relations conveyed by the connectives. Connectives might, therefore, not speed up the reading times for L2 readers, and might also not contribute (much) to L2 reading comprehension.

2.2.1 The role of connectives in L1 reading

A study by Britton, Glynn, Meyer and Penland (1982) investigated the effect of coherence signaling in English texts on the reading process. The participants, American university students, were instructed to read English texts whilst also releasing a button as soon as they heard a clicking sound. The researchers recorded the reaction times to the clicks, which they later linked to the amount of cognitive capacity used for the task. They found that the average reaction time to the clicking task was shorter when the participants read texts that contained coherence signaling. From this result, the researchers concluded that less cognitive capacity was used when processing texts with signals in comparison to texts without signals. This can be explained by the fact that explicit signals in a text show the reader how elements are related and thus decrease the cognitive load of the task. When no explicit signals are present, on the other hand, readers are forced to infer the relational coherence between text elements on their own, which requires more cognitive effort.

Another study looking into connectives and their influence on text processing was carried out by Sanders and Noordman (2000). They investigated the effect of linguistic markers in Dutch texts on the online text processing of Dutch university students. The linguistic markers under investigation were causal and additive connectives as well as lexical signaling devices (‘the problem is…’, ‘another aspect is…’). Each text was presented to the participant sentence by sentence on a computer screen. The reading time was measured as the moment of the first appearance of a sentence until the moment the participant clicked a button, indicating that the sentence had been read. The researchers found that the average

reading time in the condition with linguistic markers was 307 ms shorter than in the condition with no markers. This is an interesting finding because the sentences with connectives contained more words, yet they were still read more rapidly than the sentences without connectives. The researchers concluded that the presence of linguistic markers sped up the processing of the text segments. This is because the connectives lowered the cognitive load of the reading task, as Britton et al. (1982) also claimed, causing the readers to process the text and its coherence more quickly. Sanders and Noordman (2000) also administered a free recall test after the participants had read all texts. The results showed that the recalls of the texts with markers did not contain more linguistic markers or coherence relations than the recalls of the unmarked texts. The researchers maintain that the connectives present in the texts, therefore, did not improve the mental representation of the texts. However, as Degand and Sanders (2002) also state, a task such as free recall is possibly not sensitive enough to register the effect of connectives on comprehension. Moreover, the task was administered after all texts had been read, so it is not surprising that little information presented by the connectives was memorized. Other tasks, which will be discussed later, might be more suitable to measure the effect of connectives on reading comprehension.

Cain and Nash (2011) investigated the effect of connectives on the processing of sentences by young native speakers of British English (ages 8 & 10). In experiments 1 and 2, the researchers used a sentence cloze task and sense judgement task to confirm that the participants understood connectives and their meaning. In experiment 3, the participants performed a grammaticality judgement task in which two clauses were linked by either an appropriate connective, an inappropriate connective, or 'and'. When focusing on the reading times, the results showed that they were significantly shorter in the appropriate connective condition than in the other two conditions. This finding could indicate that the presence of connectives speeds up the processing of sentences. However, it could also entail that the

presence of ‘and’ or an inappropriate connective simply hinders the processing of sentences, leading to longer reading times in these conditions. To look into the explanation behind this finding, the researchers conducted experiment 4, which consisted of two-clause sentences that contained an appropriate connective or no connective. The outcome of the task was similar; the reading times in the appropriate connective condition were once again significantly shorter, replicating earlier findings by Sanders and Noordman (2000). According to the researchers, this result thus provides evidence for the facilitating effect of connectives on the reading process, even in young readers.

The effect of text characteristics on the reading comprehension of Dutch secondary school students attending Dutch Prevocational Education (vmbo) was studied by Land (2009). The participants read two types of texts: texts in which each sentence started on a new line and no coherence markers were present (fragmented), and texts with continuous sentences that contained coherence markers such as connectives (integrated). The comprehension question scores were found to be higher for the integrated versions of the texts. The results thus show that students attending lower level educational programs can specifically benefit from the presence of connectives in texts.

In research by Van Silfhout, Evers-Vermeul and Sanders (2013), eye-tracking was used to investigate the effect of the presence of connectives in Dutch texts on the reading process. It was found that the connectives led the participants, Dutch secondary school students, to process the new clauses faster. Moreover, the duration of their regressions while reading the texts with connectives was shorter. The researchers appear to agree with Britton et al. (1982) in that the presence of connectives decreases the cognitive load of the reading task. They pose that connectives decrease the number of possible interpretations of the text segments. This causes the reader to be quicker at making the correct inferences while reading, which means less cognitive capacity is needed.

In the same research, Van Silfhout et al. (2013) also investigated the influence of connectives on reading comprehension. After reading a text, the participants answered comprehension questions which focused on the coherence relations present in the text. The scores on the comprehension test turned out to be higher when the participants had read a text with connectives. This result shows that the connectives not only sped up the processing of the texts, as evidenced by the reading times, but also improved the comprehension of the texts. This improved comprehension might seem to contradict the results of Sanders and Noordman (2000), who found that recall of the texts did not improve when connectives were present. As mentioned earlier, a free recall task appears to lack sensitivity for measuring text comprehension. Comprehension questions, frequently used in connective-research, have shown to provide positive results similar to those of Van Silfhout et al. (2013) and are, therefore, more suitable.

Degand, Lefèvre and Bestgen (1999) also studied whether reading comprehension was affected by the presence of connectives in a text. They investigated French university students and causal connectives in French expository texts. The results showed that the scores on the comprehension questions about the causal relations significantly improved when connectives were present in the texts. Moreover, the questions about text passages that did not contain connectives also received higher scores when the texts contained connectives. The researchers regard this as evidence showing that the causal connectives affected the parts of the text in which they were embedded as well as the global representation of the text, which thus confirms their importance for comprehension.

In summary, research on the influence of connectives on the L1 reading process seems to have confirmed that they speed up the processing of the text, resulting in shorter reading times. This result was found for both younger and older participants. Moreover, studies seem to agree on the fact that the presence of connectives lowers the cognitive load of

the reading task because they tell the reader how text segments are related. Research also appears to have confirmed the hypothesis stating that the presence of connectives improves the comprehension of a text, as evidenced by higher scores on comprehension questions. The presence of connectives in a text was found to be helpful specifically for students attending lower level educational programs. Moreover, connectives were also found to positively affect the global representation of the text, as opposed to only the text parts in which they were embedded.

2.2.2 The role of connectives in L2 reading

The influence of the presence of connectives in texts on the L2 reading process appears to have received little attention in research so far. Zufferey, Mak, Degand and Sanders (2015) conducted an online experiment using eye-tracking to investigate the sensitivity of advanced learners of English to the incorrect use of connectives. Although this study does not concern the reading process or comprehension, it should be mentioned because it demonstrates that advanced L2 learners have implicit knowledge of connectives. Dutch and French learners of English were instructed to read English sentences containing both correct and incorrect uses of several connectives. Eye-tracking was used to measure the reading times of different parts of the sentences. The results showed that the reading times in the incorrect use condition were significantly longer than in the correct condition. Closer inspection of the eye-movements of the participants showed that they noticed the incorrect uses of the connectives; they slowed down and reread sentence parts in this condition. This thus shows advanced learners of English are sensitive to incorrect uses of English connectives. Furthermore, there also appeared to be no L1 transfer involved during the task. The participants noticed incorrect uses of connectives that are correct in their native language: conditional uses of ‘when’ (an error often made by Dutch learners of English) and contrastive uses of ‘if’ (an error often

made by French learners of English). This finding indicates that the learners had a good implicit ability to notice the violation of the meaning of English connectives. However, negative L1 transfer did take place during the offline grammaticality judgement task that was also administered in the study. The Dutch participants scored lowest on the judgement of conditional uses of 'when' as incorrect, and the French learners had the lowest scores on the judgement of contrastive uses of 'if' as incorrect. For all the other uses of the investigated connectives, the learners scored as well as native speakers. These results indicate that the learners could not consciously judge uses of connectives as correct or incorrect when negative transfer from the L1 was present. The researchers pose that a likely cause of these judgement problems is "the fact that connectives encode procedural meaning that is not easily accessible to consciousness" (2015, p. 406). The fact that connectives are procedural knowledge would mean that readers use them as processing instructions. This could explain why the incorrect uses of 'when' and 'if' were noticed in the online task (processing) but not in the offline task (conscious judgement).

Degand and Sanders (2002) investigated the effect of causal connectives on the comprehension of Dutch and French expository texts. The participants, French learners of Dutch and Dutch learners of French, read texts in both their L1 and L2. After reading a text, they were instructed to answer comprehension questions about the text. The results showed that the participants scored significantly better on the questions about texts in their native language. Moreover, the comprehension scores in both the L1 and L2 were higher for all texts with connectives in comparison to texts with no explicit marking. Interestingly, the impact of the positive effect on comprehension was the same in the L1 and L2 condition. The researchers concluded that the presence of connectives facilitates the construction of a mental representation of the text in both the L1 and L2. Moreover, the results replicated earlier

findings of Degand et al. (1999) in that the presence of connectives also lead to better scores on questions about aspects of the text other than causal relations.

The contribution of knowledge of connectives to reading comprehension has not been studied extensively throughout the years. A study carried out by Crosson and Lesaux (2013) investigated the effect of knowledge of connectives on reading comprehension above and beyond vocabulary knowledge and reading fluency. The participants, native speakers of English and learners of the language living in the U.S.A., were tested on reading comprehension, connective knowledge, vocabulary knowledge, and reading fluency. Hierarchical multiple regression analyses showed that knowledge of connectives explained a significant part of the variance in reading comprehension found between participants on top of the found influence of vocabulary size and when controlling for word reading fluency. In addition, the researchers found that the effect of knowledge of connectives was smaller for English language learners than for native speakers. The proposed explanation for this result is that the English language learners, whose receptive vocabulary was significantly smaller in comparison to the native speakers, were too occupied with understanding the unknown content words in the reading passages and, therefore, did not pay much attention to the cohesion markers.

Welie et al. (2017) carried out similar research, however, they added measurement of metacognitive knowledge (defined as knowledge about text structure and strategies for reading and writing) and investigated monolingual and L2 speakers of Dutch. The results partially supported Crosson and Lesaux's (2013) conclusion in that knowledge of connectives explained a variance in reading comprehension that could not be explained by the control variables. However, the language background of the participants (monolingual or L2-speaker), along with vocabulary knowledge and reading fluency, did not show any interaction with connective knowledge. Knowledge of connectives was thus found to have the same

effect on reading comprehension for participants with different linguistic backgrounds, which appears to contradict the earlier findings of Crosson and Lesaux (2013). However, the L2 vocabulary knowledge of the two participant groups in Welie et al.'s (2017) research was much more similar than that in Crosson and Lesaux's (2013), which could explain the lack of effect of language background. Metacognitive knowledge was found to interact with knowledge of connectives. The participants with more metacognitive knowledge showed a larger influence of knowledge of connectives on reading comprehension. The researchers argue that this indicates that knowledge of connectives will only be helpful if the student also possesses metacognitive knowledge about text structure and reading strategies.

To summarize, research has shown that the presence of connectives in a text has a similar effect in the L1 and L2; it improves the reader's mental representation and thus comprehension of the text. Moreover, research has shown that knowledge of connectives contributes to reading comprehension above and beyond other influencing variables such as vocabulary knowledge, reading fluency and metacognitive knowledge. Research comparing English language learners and native speakers has shown that the contribution of connective knowledge was smaller for the language learners. This could confirm the hypothesis posing that L2 readers encounter a larger number of unknown words while reading, making it difficult to understand textual relations, even when knowledge of connectives is present. Alternatively, it could also confirm that too much cognitive capacity is dedicated to understanding the unknown words, making it difficult to also attend to the relations presented by connectives. Further research is necessary to find out what the explanation behind the weaker contribution is. Lastly, research has also shown that advanced language learners can correctly judge the use of connectives in an online task, and thus have implicit knowledge of connectives. This suggests that connectives are acquired as procedural knowledge by L2 learners and that these readers use them as processing instructions while reading.

3. Research question and hypothesis

3.1 Research question

So far, research on the contribution of connective knowledge to reading comprehension has studied participants learning an L2 in an immersion setting, which involves a large amount of exposure and implicit learning of connectives. Participants in a formal foreign language learning setting, with only a limited amount of weekly instruction, have not yet received attention. Investigation of this learning environment could provide new theoretical insights. The limited instruction time and exposure may cause connectives to be treated as declarative, rather than procedural, knowledge and be acquired accordingly. If knowledge of connectives is acquired differently than it appears to be acquired in naturalistic L2 learning, this could mean that its contribution to reading comprehension is also different. This study will provide more insight into this matter. In line with earlier research on the topic, vocabulary knowledge and reading fluency will be measured along with connective knowledge and reading comprehension so that they can be controlled for during the analysis. In addition, working memory will be measured, and information about out-of-class language exposure and the age of acquisition will be gathered, so that their influence can function as extra control variables during the analysis. The research question of this thesis is the following:

Does knowledge of English connectives contribute to the reading comprehension of Dutch secondary school students when controlling for vocabulary knowledge, word reading fluency, working memory, out-of-school language exposure and age of acquisition?

3.2 Hypotheses

Previous research has shown that connective knowledge contributes to the reading comprehension of L2 learners beyond other influencing variables (Crosson & Lesaux, 2013; Welie et al., 2017). The participants in the current study are foreign language learners in a formal setting, and it is possible that the same contribution will be found for this group of readers. Degand and Sanders (2002) have demonstrated that the presence of connectives in texts improves the reading comprehension of L2 learners. However, their participants were students studying an L2 at university and the researchers state that their proficiency was, therefore, high enough to understand and make use of the connectives present in the text. They argue that learners with lower proficiencies cannot benefit from connectives because the skill to use them for the establishment of coherence relations has not yet been transferred from the L1. Crosson and Lesaux (2013) also discuss lower proficiency learners and pose that they encounter more unknown words while reading and could, therefore, spend too much cognitive capacity on translating to notice connectives in a text and benefit from their presence. The participants in the current study are foreign language learners in a formal setting, who can be assumed to vary in proficiency and vocabulary size. This might have an influence on the extent to which the learners can benefit from their connective knowledge. The fact that learners in an instructed setting possibly do not acquire connectives as procedural knowledge and, therefore, do not treat them as processing instructions, could also influence their benefit of connective knowledge (Zufferey et al., 2015).

In conclusion, it is hypothesized that knowledge of connectives will contribute to the reading comprehension of the foreign language learners in the current study. Moreover, it is also predicted that vocabulary size influences the contribution of knowledge of connectives to reading comprehension. Those with less vocabulary knowledge are expected to benefit less from their connective knowledge.

4. Method

4.1 Participants

The participants in this study were 50 Dutch secondary school students, taken from two havo-4 classes. This specific educational level and year was chosen because it is a pre-exam year. Throughout this school year, the focus in the havo-4 English lessons shifts more and more towards reading comprehension, as this is the only skill tested in the English central exam. During the lessons, havo-4 students are exposed to longer (expository) texts in which different coherence relations and connectives are present. This makes knowledge of connectives important and something that is expected to be covered in the English lessons. Havo-students are also often found to struggle with English reading comprehension, and it is thus interesting to investigate whether knowledge of connectives is something they can benefit from while reading in English.

Before the testing began, the participants first filled in a short survey (Appendix A) with which important information such as age, possible bilingualism, the age at which they started receiving English lessons, and out-of-school exposure was gathered. To increase the accuracy of the estimation of language exposure, the participants filled in a scheme indicating how many hours a day on average they spent on activities such as watching English movies, listening to English music, and playing English games. Furthermore, the two teachers teaching the classes were inquired about students with dyslexia, so that these students could be excluded from the analyses.

The other participants in this study were 12 English teachers who filled in the online questionnaire on the treatment of connectives in the coursebooks they use in their lessons. The questionnaire was shared on an online discussion platform for English teachers in the Netherlands. Unfortunately, not much information about these teachers is available because

the questionnaire was filled in anonymously. What can be said is that all respondents taught English at Dutch secondary schools. Moreover, most teachers in the respondents group had teaching experience in both the lower (1, 2 & 3) and higher grades (4, 5 & 6). The teachers also reported to have experience with varying educational levels (vmbo, havo, vwo & bilingual education) and English coursebooks (e.g. Stepping Stones, All Right!, Of Course, Gold, Solutions, Think).

4.2 Instruments

The general set-up of this study was comparable to that of Crosson and Lesaux (2013), and Welie et al. (2017). It contained measurement of knowledge of connectives, reading comprehension, vocabulary knowledge and word reading fluency. In addition, it also included measurement of working memory as a control variable. Metacognitive knowledge, which Welie et al. (2017) also measured in their research, was not included in this study due to the limited time available for the testing of the participating classes. Each used instrument is described in more detail below.

Knowledge of connectives. To determine the participants' knowledge of English connectives, a test measuring this kind of knowledge was developed specifically for this research. The connective categorization developed by Halliday and Hasan (1976), a straightforward tool that is often used in connective research, was used for the selection of the connectives. The categorization distinguishes between *additive, adversative, causal,* and *temporal* connectives. For this research, a number of connectives were selected from each category, amounting to a total of 35 connectives. The selection of connectives used in this study can be found in Table 1.

Table 1. Connectives Targeted in Connective Knowledge Test

Category	Connectives
Additive	additionally, as well as, moreover, in addition, furthermore, also, such as, and (8)
Adversative	even though, on the contrary, although, however, while, on the other hand, at the same time, whereas, but (9)
Causal	so, as a result, consequently, because, therefore, hence, thus, for (8)
Temporal	first, first of all, to begin with, to start with, meanwhile, after, afterwards, to sum up, lastly, in the end (10)

To measure knowledge of each of the 35 connectives, the participants were presented with three fill-in-the-gap texts (Appendix B). Each text contained a number of gaps in which a connective had to be filled in. The connectives from which the participants could choose were presented above each text. A text format, rather than a sentence format, was chosen for this test because it provided the participants with more context information, which helped them fill in the correct connective. This provided the researcher with a more representative picture of the true connective knowledge of the participants. In addition, the text format was chosen because the probability of participants guessing the correct connectives decreases when the number of answer options increases. Because the test was meant to measure connective knowledge, the difficulty level of each text could not be too high, as this would cause comprehension problems. Therefore, it was made sure that the texts that were chosen for the task matched the description of suitable texts for CEFR-level B1 (Intermediate), which was the current reading level of most of the havo-4 participants. To ensure that the test was not too difficult for the target group, it was first reviewed by a few English teachers. Their feedback confirmed that the task and texts were suitable for havo-4 students.

Reading comprehension. The Reading Comprehension Test consisted of three texts on different topics (Appendix C). Each text contained several connectives (which were also used in the Connective Knowledge Test) to signal relationships between text elements. Text 1 was an expository text on entrepreneurship, text 2 a narrative about a strange car journey, and text 3 a news article on the popularity of the country side in Great Britain. All three texts were authentic; adjustments were only made when they would improve the suitability of the text for the target group. Each text was accompanied by a few questions which specifically asked participants to provide information for which understanding of the connectives in the text was helpful. Once the participants had read a text and started answering the questions, they were not allowed to look back at the text. The questions about text 1 were open questions, also called bridging inference questions by Van Silfhout (2014), about information in the text that was signaled with connectives. Multiple-choice questions were deemed unsuitable for this test as they would provide the participants with the opportunity to guess the correct answer. For texts 2 and 3, participants were asked to fill in situation model questions, which have also been used in research by Land (2009) and Van Silfhout (2014). For this kind of question, information from the text has to be placed into the empty boxes of a scheme, which can have different shapes. In the case of text 2, the narrative contained quite a few temporal connectives and the scheme, therefore, had the shape of a timeline. Text 3 contained cause-and-effect relations, which had to be placed into a scheme in which the connectives signaling these relations were already present. Because the participants were not allowed to look back at the texts while answering, the information that had to be filled in into the schemes was provided in the form of short sentences. This was done to ensure that the task did not require too much cognitive capacity.

Vocabulary knowledge. To measure the size of the participants' receptive English vocabulary, Version 2 of the revised Vocabulary Levels Test, originally designed by Paul Nation, was used (Schmitt, Schmitt & Clapham, 2001). This test measures receptive knowledge of vocabulary at four vocabulary frequency levels (2.000, 3.000, 5.000 & 10.000), and an academic word level. Each level consists of clusters of six words and three definitions. To complete the test, the participant has to match each definition with one of the six given words. Each frequency level originally consists of 30 items spread over ten clusters. However, due to time constraints, the test had to be shortened to 18 items per frequency level. In addition, the academic word level was excluded from the test because it contained words that the participants could not be expected to be familiar with. The final form of the Vocabulary Knowledge Test used in this study can be found in Appendix D.

Word reading fluency. The participants' English word reading skills were measured using the word reading test for English developed by the *Expertisecentrum Nederlands* (Kleijnen, Steenbeek-Planting & Verhoeven, 2008). The test was originally designed as a tool to detect dyslexia in Dutch first year secondary school students. However, a small pilot study had shown that, with some adjustments, it could also be used with havo-4 students.

The Word Reading Fluency Test consisted of four rows of English words, increasing in difficulty, on a sheet of paper (Appendix E). The participants were asked to read the words in a rapid though clear manner. They were given 45 seconds to read as many words as they could. The score on the test was calculated by counting the number of words the participant was able to read in 45 seconds and subtracting the number of words he or she pronounced incorrectly. This final score provided an indication of the participant's reading speed and accuracy.

Working memory. Because the reading comprehension questions were quite demanding on the working memory, and this could influence the scores on the comprehension test, working memory was measured using a Digit Span Test. Each participant was shown a sequence of three digits appearing one by one on a computer screen. After the sequence finished, the participant was asked to click the digits on the screen in the same order as he or she had just been shown. After entering the digits, the computer indicated whether the order was correct, and when it was, a next sequence followed with four digits. Each participant continued in this way until the computer indicated that the entered order of digits was incorrect. The researcher kept track of the highest number of digits that the participant was able to sequence in the correct order. This highest number formed the score of the participant on the Digit Span Test.

Treatment of connectives in English lessons. An anonymous online questionnaire was administered to find out how connectives are treated in English coursebooks and English lessons at Dutch secondary schools (Appendix F). The questionnaire first asked the respondents to share which classes they taught and which coursebooks they used for each class. Afterwards they were asked to describe how connectives are covered in the coursebooks they use, and how they cover them in their lessons. Lastly, the teachers were given a set of statements, from which they were asked to select the ones that fittingly described the treatment of connectives in their lessons.

4.3 Procedure

Before the experiment was carried out, the Connective Knowledge Test and Reading Comprehension Test were first developed. For this, different sources of authentic English reading materials were consulted. Several English teachers were also asked to review the

tests to ensure they were suitable for the participants. Once the development and reviewing of the tests was completed, the testing could begin.

The Connective Knowledge Test and Reading Comprehension Test were administered at different moments because they both contained connectives. Completing one test right after the other could improve the score on the second test because the participants' knowledge of connectives could have been activated while taking the first test. Therefore, the Connective Knowledge Test was administered on the first test day, along with the Vocabulary Knowledge Test. Both tests fit into one regular lesson hour at school. On this first test day, the Connective Knowledge Test was handed out first because it measured one of the main variables investigated in this research and it was thus important to have a score that was as accurate as possible. The scores of the second test that was taken were more likely to be influenced by decreased motivation and concentration. The order of the texts in the connective test was counterbalanced across participants so that they started with different texts and cheating was not possible. The students read the fill-in-the-gap texts and filled in the correct connectives. When everyone was finished, the tests were collected, and the Vocabulary Knowledge Test was handed out. Again, when all tests were completed, they were collected by the researcher. Both tests were preceded by a short introduction to clarify how they worked and were taken in complete silence.

One week later, the Reading Comprehension Test was administered during another lesson hour. After a short introduction, the test was handed out. As with the Connective Knowledge Test, the order was counterbalanced across participants. Each participant first read a text, then flipped the page so that the text could not be reread and answered the questions about that text on the next page. Each text was read in this way. The test was taken in silence and dictionaries were not allowed. Once everyone was finished, the tests were collected.

The Word Reading Fluency Test and the Digit Span Test were administered in one-on-one sessions. On a school day, each participant visited the researcher in a quiet and empty classroom. The researcher first introduced the reading task and provided the participant with instructions and the list of words. After the starting signal, the participant read as many words as possible in 45 seconds, timed by the researcher with a stopwatch. Each participant was recorded so that the scoring could take place later on. Right after the Word Reading Fluency Test, the Digit Span Test was administered. The researcher first provided instructions and then let the participant take the test on a laptop while keeping record of the highest number of digits that was memorized in the correct order.

Once all data were collected, the tests were scored using correction models (no correction for random chance). The scores on the Word Reading Fluency Test and Digit Span Test were also calculated and the answers to the questionnaire were analyzed. Next, the statistical program R (Bates, Maechler & Bolker, 2013) was used to investigate whether knowledge of connectives contributed to reading comprehension above and beyond vocabulary knowledge, reading fluency, and working memory. To do this, multilevel linear regression analyses were used.

5. Results

5.1. Experiment

Table 2 presents descriptive statistics of the performance on the five measures used in this study as well as information on the background variables.

Table 2. Means and Standard Deviations of Five Measures and Background Variables

Measure	Mean (*SD*) (*n* = 50)
Reading Comprehension Test	14.46 (5.42)
Connective Knowledge Test	12.78 (5.66)
Vocabulary Knowledge Test	44.64 (12.66)
Word Reading Fluency Test	65.68 (7.34)
Working Memory Test	5.1 (1.04)
Background variable	Mean (*n* = 50)
Exposure to English (hours per day)	5.18
Age (years)	15.36
Age of Acquisition (years)	10.98

The data were analyzed using multilevel linear regression in R (Bates, Maechler & Bolker, 2013). Multilevel modelling provides a way of analyzing data with a hierarchical structure; in this model students are nested within different classes. In all analyses, Class was included as a random factor.

We first created a model in which the Reading Comprehension Test Score was predicted by the Connective Knowledge Test Score (Model 1). In Model 2, we added Vocabulary Knowledge Test Score, which significantly improved the fit ($x^2(1) = 5.39$, $p = .02$). After that, we added an interaction of Connective Knowledge Score and Vocabulary Knowledge Score, which did not improve the fit and revealed no significant interaction between connective knowledge and vocabulary size ($\beta = -.01$, SE = .01, $t = -1.53$, $p = .13$). Subsequently, we added all other predictors (Word Reading Fluency, Working Memory

Capacity, Amount of Exposure, Age of Acquisition, Age of Instruction) one by one. However, these predictors were not significant and did not improve the best-fitting model (Model 2). The coefficients of Model 2 are presented in Table 3.

Table 3. The Best-Fitting Model

	β	SE	t value	p value
(Intercept)	3.36	2.19	1.53	0.13
Connective Knowledge Test	0.36	0.14	2.60	0.01
Vocabulary Knowledge Test	0.14	0.06	2.31	0.03

As is evident from Table 3, both connective knowledge and vocabulary knowledge predict the performance on the Reading Comprehension Test. Hence, connective knowledge contributes to reading comprehension, even when vocabulary size is controlled for. Figures 1 and 2 illustrate the positive correlations found between reading comprehension and connective knowledge and vocabulary knowledge.

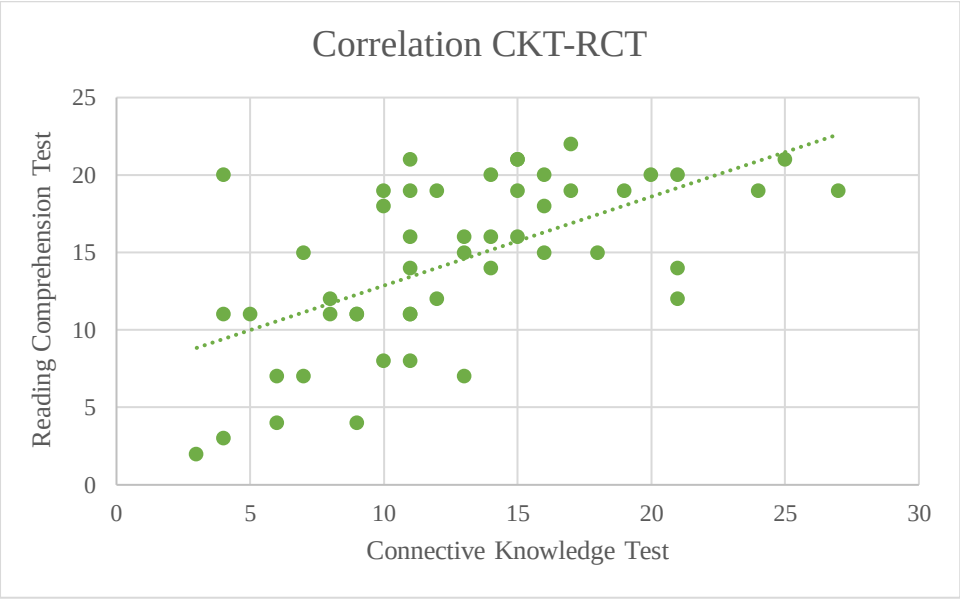

Figure 1. Correlation between scores on the Connective Knowledge Test (CKT) and Reading Comprehension Test (RCT).

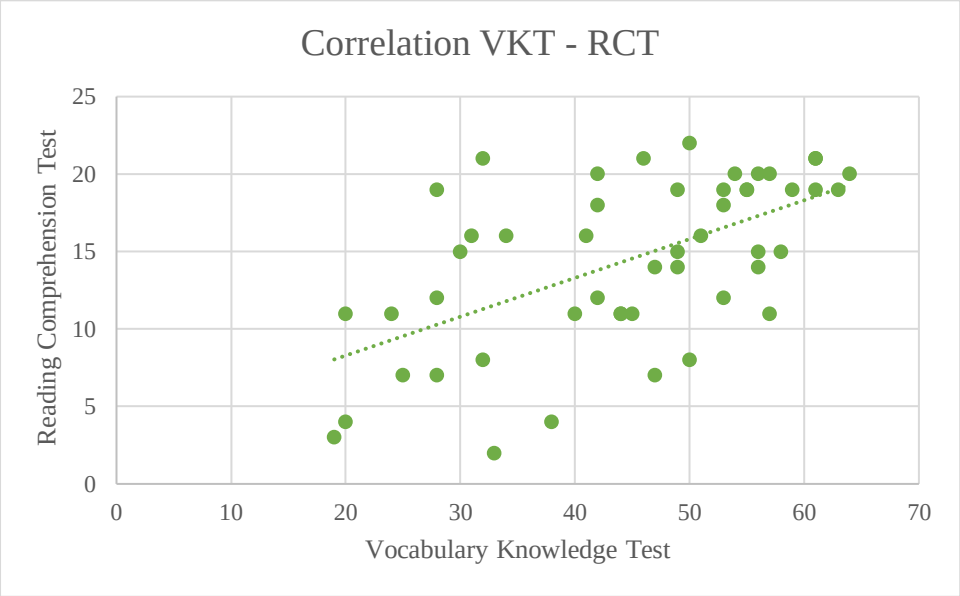

Figure 2. Correlation between scores on the Vocabulary Knowledge Test (VKT) and Reading Comprehension Test (RCT).

Both figures show that participants with higher scores on the Connective Knowledge Test or Vocabulary Knowledge Test generally also obtained higher scores on the Reading Comprehension Test, thus confirming the presence of a positive correlation between these variables.

5.2. Questionnaire on treatment of connectives

The responses to the questionnaire revealed that the English coursebooks that are frequently used in Dutch secondary schools (Stepping Stones, Of Course, All Right!) generally seem to treat connectives as any other kind of vocabulary. The respondents reported that in the coursebooks, connectives are placed in regular vocabulary lists, often mixed in with the other vocabulary. Only some teaching methods were reported to place connectives in a separate list to draw more attention to their special function. Moreover, the teachers that worked with the coursebooks in which connectives were placed in the vocabulary lists seemed to treat them as the other vocabulary; the Dutch translation of connectives had to be memorized and was

tested along with the other vocabulary in tests. Besides the vocabulary lists, some teachers mentioned that the workbooks they used contained a few exercises in which connectives had to be used (e.g. fill-in-the-gap exercises). However, explicit explanation of connectives in the text books was not reported. Interestingly, the teachers using coursebooks for bilingual education students reported that connectives were absent from the vocabulary lists. These teachers mentioned that connectives were covered specifically during writing exercises. Moreover, they said that connectives were also practiced and tested in reading exercises and tests. Teachers of regular English lessons also reported to test knowledge of connectives when working on reading comprehension skills. Lastly, seven out of twelve respondents reported to explicitly draw attention to connectives and the relations they convey in their lessons.

6. Discussion

6.1. Relation between connective knowledge and reading comprehension

The present study aimed to shed light on the relationship between knowledge of English connectives and the reading comprehension skills of Dutch secondary school students. Besides these two variables, a number of other variables were also measured so that their influence on reading (if present at all) could be controlled for during the analysis. The results showed positive correlations between connective knowledge, vocabulary knowledge and reading comprehension; participants who scored higher on the Connective Knowledge Test or Vocabulary Knowledge Test also performed better on the Reading Comprehension Test. In this study, the connective knowledge and vocabulary knowledge of the participants thus predicted their reading comprehension.

Moreover, using a multilevel linear regression model, connective knowledge was found to contribute to reading comprehension above and beyond vocabulary knowledge. This entails that knowledge of connectives explained a variance in the reading comprehension scores that could not be explained by difference in vocabulary size, which confirms its unique contribution to reading. This finding concurs with earlier research by Crosson and Lesaux (2013) and Welie et al. (2017), who both found that connective knowledge uniquely contributed to L2 reading comprehension. However, the current study concerned reading in a formal foreign language learning environment, rather than reading in an L2 setting. An instructed foreign language setting typically involves less exposure to the language on a daily basis and fewer available opportunities to use the language. The results of this study have shown that in an instructed foreign language setting, more knowledge of connectives leads to better reading comprehension, thus extending earlier findings to a different learning context.

What should be explained next is why connective knowledge contributes to reading comprehension in a foreign language. It is generally agreed upon that connectives help the reader form a clear mental representation of the text, both in the L1 and L2 (e.g. Sanders et al., 1992; Cain & Nash, 2011; Van Silfhout et al., 2014; Welie et al., 2017). This is because connectives make the coherence relations that are present in a text explicit. While reading a text, a reader is constantly confronted with new information that has to be linked to what has been read before. The presence of a connective explicitly tells the reader how the new information has to be linked to the preceding information. This insight into the textual relations within a text improves the reader's comprehension of the text. Knowledge of connectives and the relations they signal is, therefore, useful for a foreign language reader. When connective knowledge is absent, the reader does not know what link the connective conveys and has to infer the textual relations without help. This requires more cognitive effort and is not always successful, causing text comprehension to suffer.

Besides less language exposure, a formal foreign language learning setting also seems to entail that connectives are treated as any other kind of vocabulary and, therefore, acquired as declarative knowledge. The questionnaire administered during this research has revealed that popular English coursebooks used in Dutch secondary schools generally seem to treat connectives as regular vocabulary; they are part of word lists, their Dutch translation has to be memorized, and they are tested in vocabulary exercises and tests. This appears to indicate that Dutch secondary school students who use these textbooks acquire connectives as declarative knowledge. When learners memorize definitions of connectives, it does not entail that they also know what kind of textual relations the connectives signal when they encounter them in a text. Treating connectives as declarative knowledge, therefore, does not seem to provide complete and beneficial connective knowledge. Interestingly, the presence of connectives in word lists and vocabulary tests was not reported by teachers of students

following bilingual education programs. These teachers mentioned that connectives were only discussed and practiced during reading and writing exercises and tests. Bilingual education students receive significantly more English exposure compared to regular students, as most of the lessons they attend are given in English. Therefore, natural acquisition of connectives through lots of exposure, in which they are treated as processing instructions (procedural knowledge), seems possible in this learning setting. The incorporation of connectives in writing exercises seems an interesting idea to teach students what kind of relations connectives signal. When connectives have to be used in a writing product, it is necessary to know which connective should be used for a certain textual link between sentences. Writing tasks with connectives thus seem to be a useful form of practice.

The participants in this study did not follow a bilingual education program. The results, however, still showed that those with more connective knowledge scored better on the Reading Comprehension Test. How were these participants able to acquire knowledge about connectives that they could use while reading? As mentioned earlier, the teachers providing regular English education also reported to discuss and test connectives in reading exercises. It is possible that this, rather than the vocabulary exercises and tests, is what has helped the participants acquire more knowledge about connectives and the textual relations they signal. Paying attention to connectives while reading provides exposure to their use, and thus could have helped the students with learning which relations different connectives convey. It seems likely that participants who picked up on this during the lessons were able to use their knowledge during the Reading Comprehension Test. Transfer of L1 strategies for using connectives while reading and more implicit exposure to connectives in daily life might also have been involved in helping these participants acquire and use connective knowledge and score better than the participants who had little connective knowledge.

6.2 Role of vocabulary knowledge

Besides connective knowledge, vocabulary knowledge was also found to contribute significantly to reading comprehension in a foreign language. This finding confirms the existing body of literature claiming that vocabulary size is an important predictor of reading comprehension in the L1 and L2 (e.g. Stahl, 1983; Van Gelderen et al., 2003; Jeon & Yamashita, 2014). Research has shown that for L2 learners, text comprehension improves when a higher percentage of vocabulary in the text is known to the reader (Schmitt, Jiang & Grabe, 2011). Readers with larger vocabularies in a foreign language will, therefore, have better comprehension of texts in the foreign language because they know more words. The standard deviation of the scores on the Vocabulary Knowledge Test (12.66) indicates that the scores varied quite widely. This means that the participant group contained students with very large English vocabularies, but also students with small vocabularies. According to Crosson and Lesaux (2013), it is likely that readers with small vocabularies will benefit less from knowledge of connectives because they encounter more unknown words. The translation of these words requires most of their cognitive capacity, making them unable to allot attention to the connectives in the text. Based on this, it was hypothesized that vocabulary size would influence the contribution of connective knowledge to reading comprehension. The results of this study, however, have shown that the contribution of connective knowledge was the same for all participants, regardless of their vocabulary size. Vocabulary size thus did not influence the contribution of connective knowledge to reading comprehension; those with less vocabulary knowledge did not benefit less from their connective knowledge while reading.

6.3 Reading fluency

The other measured variables (word reading fluency, working memory, exposure to English & age of acquisition) were not found to improve the model fit and, therefore, did not contribute to reading comprehension above the effect of vocabulary and connective knowledge. When zooming in on word reading fluency, Crosson and Lesaux (2013) found that it explained almost 24% of the variance in the reading comprehension scores in their study. The reading fluency test used in their study was comparable to the one used in the present study. However, the participants were of elementary school age rather than secondary school age. An explanation for the contradiction of findings between the present study and the study by Crosson and Lesaux (2013) could be the age threshold on language decoding skills that was discussed earlier (Melby-Lervåg & Lervåg, 2011). The participants of the current study might have reached an age at which differences in reading fluency no longer significantly influence reading comprehension. Welie et al. (2017) also used secondary school students as participants in their study and measured reading fluency with a sentence verification task. They found that reading fluency correlated only weakly with text comprehension. The outcome of this study and the present study thus seems to confirm that for older learners, reading fluency is at best only a minor contributing factor to reading comprehension because at a certain age, sufficient decoding skills have been acquired and additional gains do not further increase comprehension.

6.4 Implications for teaching practice

The results of this study have shown that knowledge of connectives contributes to the reading comprehension of Dutch secondary school students who are learning English as a foreign language. This finding has implications for the English lessons taught at Dutch secondary schools. The questionnaire revealed that connectives currently do not seem to receive a lot of

attention in English coursebooks and lessons. When they do, the focus appears to be on the acquisition of connectives as declarative knowledge, which does not seem to provide knowledge useful for reading comprehension. Rather than focusing on the direct translation of connectives, putting more emphasis on the different processing instructions that they convey would be advisable. This could be achieved by incorporating connectives in reading exercises, something which already appears to be in practice. Additionally, the exposure to connectives could be increased by enhancing the input the students receive, for example by highlighting connectives in texts, or by flooding students with input of connectives. This will lead students to pay more attention to connectives and learn what kind of textual relations they convey. The incorporation of connectives in writing exercises, as already appears to be common practice in bilingual education, could also be useful in helping students understand and use connectives.

6.5 Limitations and future directions

As with all research, this study unfortunately has its limitations. First of all, the circumstances under which the tests were administered were not always optimal and varied between the different testing moments. The tests had to be administered during the regular lesson hours, which meant that there was only a limited amount of time available each day and the administration of the tests had to be spread out over several days. The concentration and motivation of the participants varied from day to day, leading to variation in testing circumstances. The participants were also spread out over two classes, which caused even more variation in the testing circumstances between participants. This situation could have had a negative impact on the reliability of the obtained data. Secondly, the tests used to measure connective knowledge and reading comprehension were designed for, but not pre-tested within the target group. A more carefully tested or standardized instrument might have

been more reliable in its measurement of the two variables. Lastly, it is likely that the Connective Knowledge Test and Reading Comprehension Test measured the same construct, at least to some extent. Even though the tests differed in design, the texts in the Reading Comprehension Test contained many connectives and the questions specifically focused on the textual relations signaled by connectives. Connective knowledge can, therefore, be said to have been measured in both tests. This limits the conclusions that can be drawn about the correlation between the two tests.

To improve future research on the contribution of connectives to reading comprehension, studies could include additional measures to test connective knowledge and reading comprehension to provide more accurate and precise measurement of the two constructs. A reading test without any focus on connectives could be used alongside the test used in this study to measure reading comprehension. For connective knowledge, an additional task focusing on the translation of the connectives might be useful. Another idea for future research could be to combine online and offline measures to investigate reading comprehension in a foreign language. This could shed more light onto what foreign language learners do when they encounter connectives while reading a text. The present study has found that vocabulary size did not influence the contribution of connective knowledge on reading comprehension. Future research could explore whether there are other factors, working memory for example, that cause readers to be unable to benefit from their knowledge of connectives.

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Appendix A

Questionnaire language background

Beantwoord <u>alle</u> onderstaande vragen.

1. Naam: _____

2. Geboortedatum: _____

3. Klas: _____

4. Docent Engels: _____

5. Welke taal (of talen) spreek je thuis?

_____

6. Wanneer kreeg je voor het eerst lessen Engels? (Bijvoorbeeld: groep 7, eerste klas etc.)

_____

7. Deze vraag gaat over hoeveel je wordt blootgesteld aan de Engelse taal. Hoeveel uur **per dag** besteed je gemiddeld aan de volgende activiteiten? Vul het schema in. Je kunt ook 0 uur of 0,5 uur invullen.

Activiteit:	**Uur per dag:**
Luisteren naar Engelse muziek/audioboeken/podcasts	
Kijken van Engelse video's op YouTube	
Kijken van Engelse tv-programma's	
Kijken van Engelse series/films (op Netflix etc.)	
Lezen van Engelse boeken/artikelen/blogs	
Spelen van games in het Engels	

Appendix B

Connective Knowledge Test

1. Use the words below to fill in the gaps in the text. Each word can only be used once.

after, even though, so, additionally, afterwards, on the contrary, as well as, for, meanwhile, first, as a result, also

Once upon a time, a family of brown bears lived in a lovely wooded area. Their house was located next to an old willow tree _____ a small stream. One day, _____ the bears had left their home to go fishing, a little girl came to their house. _____, she knocked on the door. Then, _____ no one answered her knock and she should have walked on, she entered the house. She ate some of the bears' food and _____ drank some of their milk. _____, she napped in one of their comfortable beds. The bed was a bit too small for her, _____her feet were sticking out at the end. _____, the bears returned to their house and were surprised to see their door open. Upon seeing the girl sleeping in their bed, they bared their teeth and _____ roared as loudly as they could, which woke her up. The girl did not apologize to the bears, _____, she stayed quiet and fearfully ran back to her own home! _____ of her experience at the bears' house, she never again went into the woods alone. She also swore to never enter a house without permission, _____ it had not turned out so well.

2. Use the words below to fill in the gaps in the text. Each word can only be used once.

consequently, although, because, however, while, therefore, but, first of all, moreover, in the end, on the other hand, such as

Today, millions of people want to learn or improve their English, _____, it is difficult to find the best method. Is it better to study in an English-speaking country, _____ the United Kingdom or America, or to study the language in your own country?

The advantages of going to an English-speaking country seem obvious. _____, you will be able to listen to the language all the time when you are in the country _____ you will be surrounded by people speaking the language. _____, you have to speak the language if you want to communicate with other people. _____ you can always speak your mother tongue in your home country, this will not be the case when you travel abroad.

_____, there are also advantages to staying at home to study English. It means you don't have to make big changes to your life. It is also a lot cheaper than going to an English-speaking country. If you have a good teacher in your home country, you will also be able to learn the language. It might be less fun than travelling, _____ it can still be effective.

_____, the best choice might be to spend some time in an English-speaking country, _____ this is only possible if you have enough time and money. Unfortunately, many people will not have the opportunity to go because of the costs. _____, a good alternative for many is to study at home. The most important thing to do in this situation is to maximise your opportunities: only speak English in class and try to use English whenever possible outside the classroom. _____, your English proficiency will improve.

3. Use the words below to fill in the gaps in the text. Each word can only be used once.

at the same time, to begin with, in addition, to sum up, and, hence, furthermore, thus, whereas, to start with, lastly

_____ some people believe that animals should be treated as humans _____ that they have similar rights, others think that we can use them as we desire for food and medical research. In this essay, both points of view will be discussed.

People believe that the exploitation of animals is acceptable for several reasons. _____, they seem to think that humans are the most important beings on the planet and everything must be done to make sure they survive. If this means experimenting on animals so that we can fight and cure diseases, then this is more important than animal suffering. _____, it is believed by some that animals do not feel pain or loss as humans do. If we have to kill animals for food or other uses, it is _____ morally acceptable.

_____, others do not believe these arguments are valid. _____, it has been shown several times with secret filming in laboratories that animals suffer in small cages and feel as much pain as humans do. _____, a substantial amount of animal research is done for cosmetics, not to find cures for diseases, and this is unnecessary. _____, it has also been proven that humans can get all the nutrients and vitamins that they need from green vegetables and fruit. _____, having to kill animals for food is not a good argument.

_____, although some people argue killing animals for research and food is ethical, many would argue there is enough evidence to demonstrate that this is not the case, and that steps must be taken to improve the rights of animals.

Appendix C

Naam: _____

Reading Comprehension Test

Read the text carefully and answer the questions on the next page.

Text 1

Would you like to become an entrepreneur in the future? An entrepreneur is someone who runs his or her own business. There are entrepreneurs in healthcare, such as GPs and dentists. Furthermore, there are entrepreneurs who are artists and entertainers by profession. Farmers and retailers are also examples of entrepreneurs. Many people would like to start their own business because they think a company of your own will give you much freedom. For example, you will be your own boss, which provides enormous advantages because you can decide how many hours a day you work. In addition, you can prioritize your tasks and decide which ones you carry out first and which ones will be dealt with later. However, being an entrepreneur also has its disadvantages; you are your own boss and thus have to do everything yourself. First of all, you have to keep record of the finances of your business and, moreover, you have to arrange all kinds of insurances. Lastly, you have to contribute to your pension, which can take up quite a sum of money.

A retailer is another example of an entrepreneur. How does the enterprise of a retailer work exactly? First of all, the retailer has to invest, because otherwise he has nothing to sell in his shop! The purchase price of the products is called the purchase value. The retailer asks a higher amount of money for his products than what he paid for them himself. As a result, he makes a profit. The difference between the turnover and the purchase value is called the gross turnover.

From this point, you are **NOT** allowed to look back at the text!

Answer the questions below, you can use <u>Dutch</u> if you want to.

1. Being an entrepreneur has great advantages (voordelen). Which two major advantages were mentioned in the text?

_____

_____

_____

_____

2. Being an entrepreneur also has a major drawback (nadeel): you have to do everything yourself. Give two examples of things that entrepreneurs have to do themselves.

_____

_____

_____

_____

3. Explain why the first activity of a retailer is to invest (investeren).

_____

_____

_____

_____

4. Explain how a retailer makes profit (winst).

_____

_____

_____

_____

Read the text carefully and answer the questions on the next page.

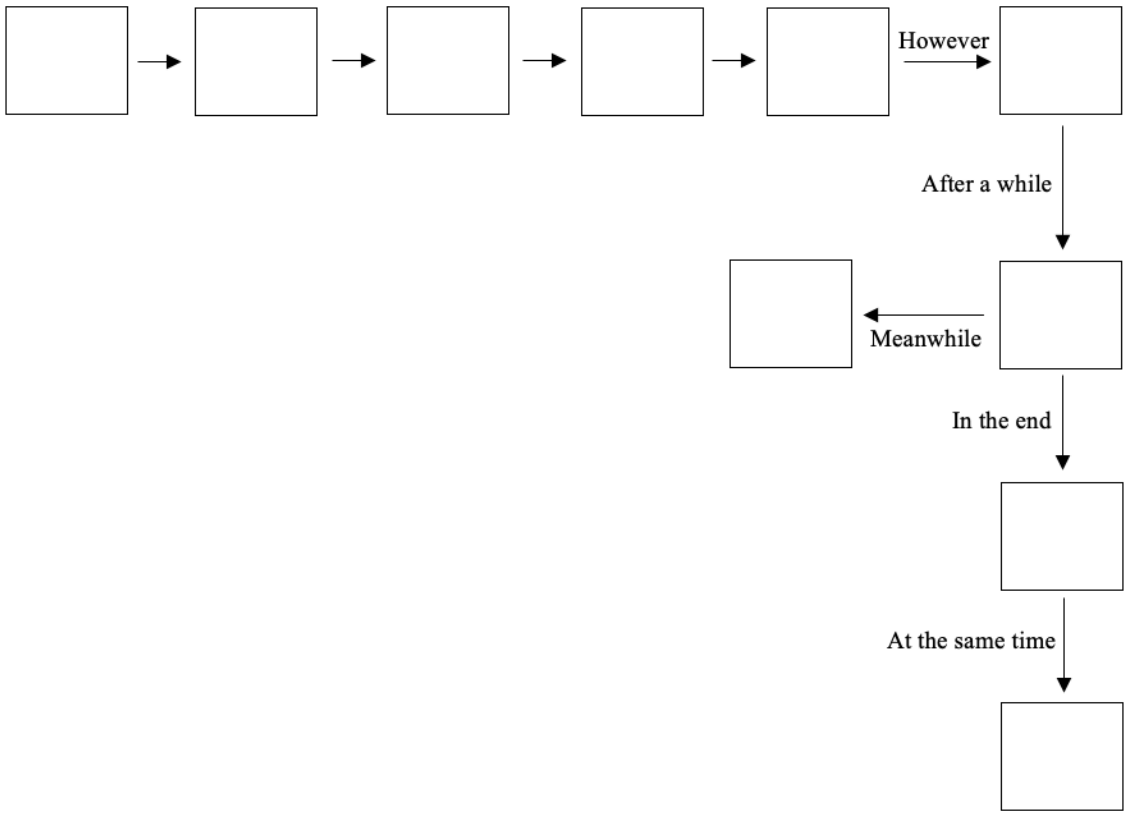
Text 2

Mrs. Knowles and her three sons were driving from Perth to Adelaide in the early hours one morning in 1988. Suddenly, she saw a light flashing on the road ahead, and slowed down thinking that it was a traffic signal. After the car had slowed down, a strange light seemed to be on top of the car, sucking it up off the road before dropping it down again. Feeling terrified and out of control, the family noticed a black powder seeping inside their car and smelt a horrible stench. In a state of shock, Mrs. Knowles drove to the nearest town and reported the incident to the police. However, the police did not believe her story and thought that she must have been so tired that she was dreaming. After a while, the police agreed to inspect the car and when they did, they saw the dust, smelt the smell and also noticed some small dents in the roof of the car. Meanwhile, a local lorry driver following the same route as Mrs. Knowles confirmed to the police that he had also seen the strange light in the distance. In the end, this story was taken up by some people as proof of the presence of aliens on earth. At the same time, other people who prefer to believe in a scientific explanation have suggested that electrical forces in the atmosphere caused this and other incidents.

From this point, you are **NOT** allowed to look back at the text!

The scheme below represents the story you have just read. Complete the scheme by putting the numbers of the sentences in the boxes. Each sentence only fits into one box. There are two sentences that do not fit into the scheme.

1. The police inspect the car and notice the damage and the smell.
2. The police think Mrs. Knowles was dreaming and does not believe the story.
3. A strange light on top of the car sucks it up and drops it down.
4. Some people give a scientific explanation for the incident.
5. Some people do not believe the story because they are religious.
6. Mrs. Knowles drives to a town and reports the incident to the police.
7. Mrs Knowles and her sons are driving early in the morning.
8. Mrs Knowles sees a light flashing and slows down the car.
9. Mrs. Knowles and her sons are glad they are safe.
10. The family is scared and notices black powder and a terrible smell.
11. Some people use the story as proof for the existence of aliens.
12. A lorry driver confirms the strange light on the road.



Read the text carefully and answer the questions on the next page.

Text 3

City life is cool; but apparently country life is cooler. More and more people in Britain want to live in the country, and this is causing more and more problems in some rural areas.

Although Britain's population is still growing, the population of British cities has been falling for years. Cities like Liverpool and Glasgow have lost about 30% of their population in 30 years. So where are people going? The answer is: to the countryside.

The English countryside has become popular because of its classic image. People imagine that life in the country is slow and calm; that there are no traffic jams, no pollution, and no crime. In addition, the small towns and villages offer people more space and most houses have gardens. Because of these two reasons, many people have moved to the countryside.

However, problems are growing. To start with, lots of people want to live in the country and work in the city. Consequently, more and more people travel long distances to go to work each day. They don't use buses because they are too slow or trains because they don't stop in the country; they use cars. Moreover, even though they live in the country, the people want to use the large supermarkets in the cities, which thus means they have to use their cars. Therefore, little villages in the countryside now have traffic problems in the morning, just like big cities. And they are getting worse. People leave cities and big towns to escape from urban problems, however, they are bringing their problems with them.

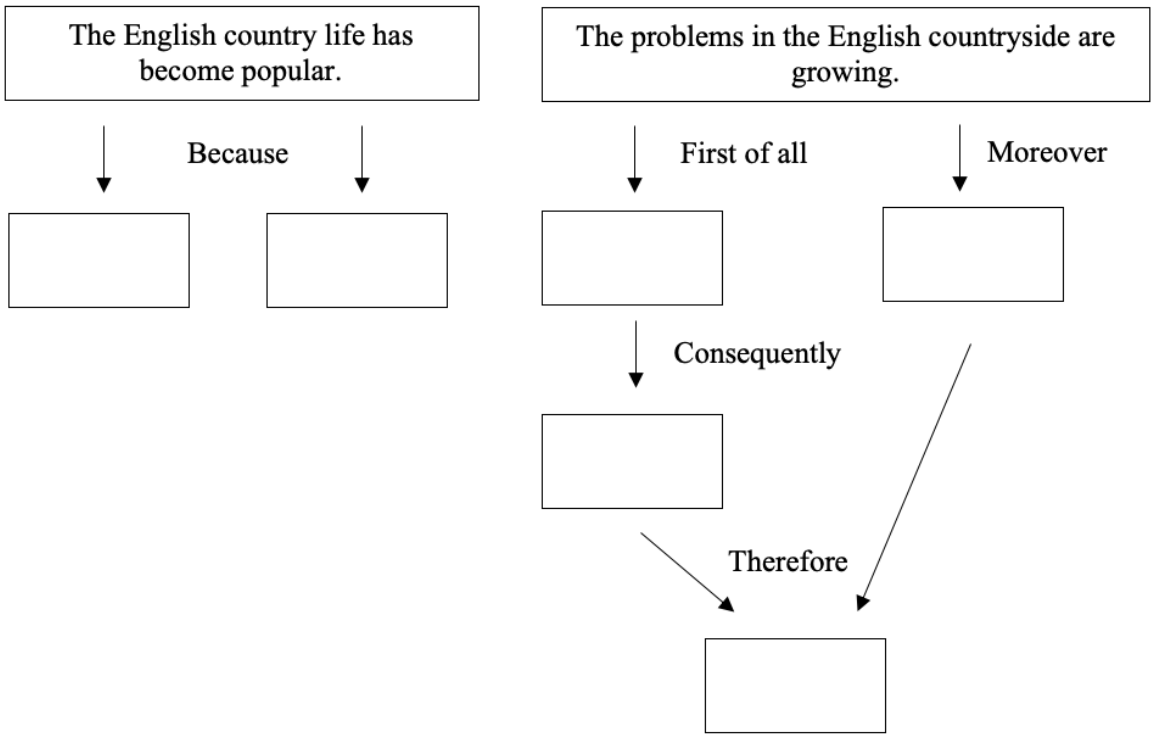
On warm summer days, and cold winter days, air pollution can be a big problem in large parts of the south of England, not just in London. Traffic jams are now often part of life, even in the country; crime has become a serious problem in rural areas.

Perhaps there is hope for the future. Britain's population might stop rising soon. From about the year 2020, it will perhaps start to fall. In 100 years' time, there will be less people in Britain than today - perhaps two million less. No doubt there will be less pollution too; oil and petrol will probably be rare by then.

From this point, you are **NOT** allowed to look back at the text!

Complete the scheme below. Put the numbers of the sentences in the correct boxes. Each sentence only fits into one box. There are two sentences that do not fit into the scheme.

1. Many people travel long distances by car to go to work.
2. Many people want to live in the country and work in the city.
3. The English countryside offers people more space and gardens.
4. The English countryside has traffic jams in the morning.
5. Many people want to use the supermarkets in the cities, so they use their cars.
6. Many people like to go on family trips to the larger cities.
7. The English countryside has a classic image, life is slow and calm.
8. The English countryside offers space for outdoor activities.



Appendix D

Vocabulary Levels Test

Instructions

This test measures your vocabulary knowledge. You must choose the right word to go with each meaning. Write the number of that word next to its meaning. Here is an example:

1 business
2 clock _____ part of a house
3 horse _____ animal with four legs
4 pencil _____ something used for writing
5 shoe
6 wall

You answer it in the following way:

1 business
2 clock __6___ part of a house
3 horse __3___ animal with four legs
4 pencil __4___ something used for writing
5 shoe
6 wall

If you have no idea about which word belongs to a certain meaning, do not guess but leave the space open. However, if you think you might know the right word that goes with a meaning, then you should try to fill it in.

NAME: ……..

The 2,000 word level

1 copy
2 event _____ end or highest point
3 motor _____ this moves a car
4 pity _____ thing made to be like another
5 profit
6 tip

1 accident
2 debt _____ loud deep sound
3 fortune _____ something you must pay
4 pride _____ having a high opinion of yourself
5 roar
6 thread

1 coffee
2 disease _____ money for work
3 justice _____ a piece of clothing
4 skirt _____ using the law in the right way
5 stage
6 wage

1 admire
2 complain _____ make wider or longer
3 fix _____ bring in for the first time
4 hire _____ have a high opinion of someone
5 introduce
6 stretch

1 arrange
2 develop _____ grow
3 lean _____ put in order
4 owe _____ like more than something else
5 prefer
6 seize

1 blame
2 elect _____ make
3 jump _____ choose by voting
4 threaten _____ become like water
5 melt
6 manufacture

The 3,000 word level

1 bull
2 champion _____ formal and serious manner
3 dignity _____ winner of a sporting event
4 hell _____ building where valuable objects are shown
5 museum
6 solution

1 blanket
2 contest _____ holiday
3 generation _____ good quality
4 merit _____ wool covering used on beds
5 plot
6 vacation

1 comment
2 gown _____ long formal dress
3 import _____ goods from a foreign country
4 nerve _____ part of the body which carries feeling
5 pasture
6 tradition

1 abandon
2 dwell _____ live in a place
3 oblige _____ follow in order to catch
4 pursue _____ leave something permanently
5 quote
6 resolve

1 assemble
2 attach _____ look closely
3 peer _____ stop doing something
4 quit _____ cry out loudly in fear
5 scream
6 toss

1 muscle
2 counsel _____ advice
3 factor _____ a place covered with grass
4 hen _____ female chicken
5 lawn
6 resolve

The 5,000 word level

1 analysis	
2 curb	_____ eagerness
3 gravel	_____ loan to buy a house
4 mortgage	_____ small stones mixed with sand
5 scar	
6 zeal	

1 cavalry	
2 eve	_____ small hill
3 ham	_____ day or night before a holiday
4 mound	_____ soldiers who fight from horses
5 steak	
6 switch	

1 circus	
2 jungle	_____ musical instrument
3 nomination	_____ seat without a back or arms
4 sermon	_____ speech given by a priest in a church
5 stool	
6 trumpet	

1 contemplate	
2 extract	_____ think about deeply
3 gamble	_____ bring back to health
4 launch	_____ make someone angry
5 provoke	
6 revive	

1 artillery	
2 creed	_____ a kind of tree
3 hydrogen	_____ system of belief
4 maple	_____ large gun on wheels
5 pork	
6 streak	

1 chart	
2 forge	_____ map
3 mansion	_____ large beautiful house
4 outfit	_____ place where metals are made and shaped
5 sample	
6 volunteer	

The 10,000 word level

1 alabaster
2 chandelier _____ small barrel
3 dogma _____ soft white stone
4 keg _____ tool for shaping wood
5 rasp
6 tentacle

1 throttle
2 convoy _____ kindness
3 lien _____ set of musical notes
4 octave _____ speed control for an engine
5 stint
6 benevolence

1 bourgeois
2 brocade _____ middle class people
3 consonant _____ row or level of something
4 prelude _____ cloth with a pattern or gold or silver threads
5 stupor
6 tier

1 dissipate
2 flaunt _____ steal
3 impede _____ scatter or vanish
4 loot _____ twist the body about uncomfortably
5 squirm
6 vie

1 scrawl
2 cringe _____ write carelessly
3 immerse _____ move back because of fear
4 peek _____ put something under water
5 contaminate
6 relay

1 blurt
2 dabble _____ walk in a proud way
3 dent _____ kill by squeezing someone's throat
4 pacify _____ say suddenly without thinking
5 strangle
6 swagger

Appendix E

Reading Fluency Test

Go	Night	Human	Delicious
And	Sweet	Twilight	Causation
Up	After	Certain	Personal
You	Woman	Scarf	Successive
By	Sudden	Furnace	Educationalist
Come	Table	Amazement	Naïve
That	Work	History	Anonymous
Just	Stove	Vehicle	Approaching
Have	Ground	Departure	Meaningless
Book	Airplane	Bandage	Neighborhood
Play	Chair	Urgent	Heterogeneous
Can	Because	Mechanic	Bicycle
Two	Beautiful	Wounded	Exercises
Boy	Slowly	Headache	Century
Blue	Watch	Performance	Available
No	Early	Grandma	Allegiance
Little	Heavy	Spectacular	Roundabout
Get	Already	Jealous	Embarrassed
Much	Laugh	Minor	Remembrance
Car	Hurry	Hysterical	Protection
From	Largest	Pedestrian	Definitely
Down	Except	Yellow	Disappointment
Fast	Evening	Mathematician	Gorgeous
Pig	Practice	Alternate	Advertisement
With	Receive	Relativity	Attractive
Said	Original	Inhabitant	Nationality
Find	Discover	Situation	Entertainment

Appendix F

Questionnaire treatment of connectives

Het onderwijzen van connectieven bij Engels

Beste docent (in opleiding),

Allereerst bedankt dat u bereid bent deze vragenlijst in te vullen. Voor mijn masterscriptie doe ik onderzoek naar connectieven bij het vak Engels. Dit zijn woorden als 'omdat', 'echter', 'daarna', 'alhoewel', 'in tegenstelling tot' etc. die in een tekst worden gebruikt om de verbanden tussen zinnen en zinsgedeelten in die tekst te verduidelijken voor de lezer. Waar ik graag inzicht in zou willen krijgen is hoe deze soort woorden bij het vak Engels worden onderwezen. De vragen in deze vragenlijst zullen hier dus over gaan. De specifieke groep leerlingen waar ik onderzoek naar doe zijn havo-4 leerlingen. Als u deze klas en/of dit niveau geen les geeft is dit echter geen probleem, alle informatie is welkom!

Alvast bedankt,

Mariëlle Ledder

* Required

Van welke klassen heeft u inzicht in de inhoud van de lesmethode(s) die gebruikt wordt/worden bij het vak Engels? Dit kunnen klassen zijn die u dit jaar lesgeeft, maar ook klassen van vorig jaar die u momenteel geen les geeft. Maak een lijstje van alle klassen en noteer bij elke klas tussenhaakjes ook de naam van de gebruikte lesmethode. *

Your answer

Hoe worden bij elke klas in de lesmethode connectieven behandeld? Denk hierbij bijvoorbeeld aan uitleg in het lesboek, woorden in woordenlijsten, opdrachten in het werkboek etc. Maak weer een lijstje met een antwoord per klas. Indien connectieven niet worden behandeld in de lesmethode kunt u dit noteren. *

Your answer

Wat is van toepassing op het onderwijzen van connectieven in de klassen in het algemeen? Vink aan wat voor de klassen algemeen gezien van toepassing is. Bij "other/anders" kunnen extra antwoorden worden toegevoegd. *

- [ ] Connectieven worden door de docent met uitleg behandeld in de les.
- [ ] Connectieven staan in de woordenlijsten die de leerlingen moeten leren, TUSSEN de andere woorden.
- [ ] Connectieven staan in de woordenlijsten die de leerlingen moeten leren, LOS van de andere woorden (aparte categorie).
- [ ] Connectieven staan niet in de woordenlijsten die de leerlingen moeten leren.
- [ ] De Nederlandse vertaling van de connectieven moet geleerd worden door de leerlingen.
- [ ] De Nederlandse vertaling van de connectieven hoeft niet geleerd te worden door de leerlingen.
- [ ] Connectieven worden samen met de andere vocabulaire getoetst in een S.O. of proefwerk.
- [ ] Connectieven worden los van de andere vocabulaire (in een aparte opdracht bijv.) getoetst in een S.O. of proefwerk.
- [ ] Of leerlingen de betekenis van connectieven begrijpen wordt getoetst in leesvaardigheidstoetsen.
- [ ] Of leerlingen de betekenis van connectieven begrijpen wordt op een andere manier getoetst (noteer dit bij "other/anders").
- [ ] Connectieven worden niet getoetst.
- [ ] Other: _____

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Page 1 of 1

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