

Teenagers' Vocabulary Knowledge and Self-Efficacy as Elements in Effective L2 Online Searches

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Abstract

As English dominates the Internet, most education systems need to prepare pupils to perform L2 information searches. Generating efficient search terms and understanding the information retrieved requires good vocabulary knowledge. This study examined the relationship between vocabulary knowledge, L2 online searching, and attitudes towards online searching. A sample of Swedish pupils' abilities in locating suitably difficult texts and learning words were tested by comparing their Vocabulary Size Test scores with the lexical density of their search results and subsequent text production. Long-term vocabulary recall and self-efficacy for searching online were also tested. The results indicate that pupils tended to read and write texts below their ability level. They were unaware that they could achieve more as their self-efficacy measures indicated high confidence levels despite rather modest skills. The challenge posed by the findings is to enable teenagers to recognize how much more effectively they could use the Internet, without damaging their confidence.

Keywords: Vocabulary size; online reading; VST; SORAB; Swedish learners of English

1. Introduction

The ability to search for information online effectively is an essential skill that all pupils should be able to manage before they leave compulsory education. International evidence indicates, however, that teachers are not explicitly teaching searching skills (e.g., Ladbroke and Probert 2011). Given that more than 60% of information on the Internet is estimated to be in English (w3techs 2021), most education systems will need to prepare students to manage these tasks in their second language (L2). This is

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especially true for nations like Sweden, as less than 1% of online information is available in Swedish (w3techs 2021). However, Sweden's national curriculum does not suggest that teaching pupils to search online falls within the domain of English studies, although the ability to use digital tools and media to search for information is one of the overall objectives (Skolverket 2018a). Similarly, the high-school curriculum states that school should contribute to 'developing the pupils' *digital competence*' (Skolverket 2018b: 3). The two subjects primarily responsible for pupils achieving digital competence are Swedish and Social Sciences. The Social Science curriculum has increased its emphasis on digitalization since 2018.

Setting tasks that require pupils to search for information online is fraught with problems, some of which are the same as for all teachers, but others that are English-specific. The former includes issues such as teaching pupils how to use advanced search functions, how to select appropriate search terms, efficient scrolling techniques for searching through the lists of site matches, the ability to recognise domain types (e.g., whether a site is advertising a product, a blog or government-endorsed information) and recognising bias within the text (Bråten and Braasch 2017). There are also numerous practical problems stemming from the diversity of sites that pupils find when they search independently. Tasks involving searching take a long time and pupils may miss key lessons. English teachers face all these difficulties and, in addition, must consider whether pupils know the vocabulary they need for searching and, once the sites have been located, for understanding the text. With the huge array of texts available in English, teachers cannot predict what sites pupils will find. All teachers have decidedly less control over what materials pupils work with when these include online searching than they would with materials specifically chosen to fulfil curriculum requirements.

Lack of control over many of the key variables also poses significant challenges for researchers and examiners. Much research in this area has made use of artificial environments rather than the real Internet (e.g., Kiili et al. 2018), as have tests of searching skills such as ePIRLS (now digitalPIRLS; IEA 2016, 2021). Artificial online environments have proven valuable for generating models of online reading (e.g., Leu et al. 2013) and generating internationally comparable tests and self-efficacy (IEA 2016). Nevertheless, these studies have low ecological validity. For example, pupils taking the ePIRLS test were eventually returned to the

desired sites if they followed the artificially generated distractors for too long. Kiili et al.'s (2018) study only allowed students to be on the wrong site for three minutes. In real classroom situations, pupils who follow distractors may never return to the task they were set. Artificial environments also allow researchers and examiners to control the language of the websites that subjects visit. Even studies that do track users on the real Internet tend to overlook the many languages available (e.g., Andersson 2017; Zhang and Duke 2008), and the subject is largely ignored even in studies with a specifically international focus (e.g., Ng and Bartlett 2017).

This study set out to explore what actually happens when pupils work online in L2 English classrooms, complete with all the 'messiness' of pupils missing classes, not following instructions and so on. The study hones in on one key aspect of L2 online searching: vocabulary. Vocabulary knowledge has been identified as the area within L2 studies to have the most instrumental effect on improving text comprehension (Perfetti and Stafura 2014), and overall success in L2 learning (Henriksen 2006). In order to read instructionally, readers need to know approximately 95% of the words in the text or they will find the text frustrating and/or stressful (Nation 2013). Combining these well-documented findings, we endeavoured to trace the connections between pupils' vocabulary knowledge, their online searching skills, their self-efficacy and their written production.

This paper combines naturalistic data from a Swedish high school with standardized tests of vocabulary knowledge and attitudes towards online searching. To the best of our knowledge, the relationships between vocabulary knowledge, searching skills and attitudes towards online reading have not been investigated simultaneously before in relation to real-life environments. The aim of this paper is to present a small-scale investigation into how these aspects of L2 English education cohere in everyday school life. The study aims to answer the following research questions in relation to a small sample of 31 pupils spread over all three years of Swedish high school:

1. How does the vocabulary size of the participating pupils relate to the vocabulary density of the English texts they find on the Internet?

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2. How well did the participating pupils use and recall unusual vocabulary evident in their online reading?
3. How did the participating pupils' beliefs about their abilities reflect their performance level?

While our small sample size does not allow for generalization, our results reveal the processes involved in pupils' searching behaviour and identifies where problems occur in real life settings.

2. Background

2.1 English in preparation for higher education and working life

English is one of three core subjects in the Swedish education system. Pupils receive a minimum of 480 hours of English during their nine years of compulsory education (Skolverket 2019). In high school, three English courses are offered: English 5 is obligatory, English 6 is necessary for university studies and English 7 is optional. This emphasis reflects the need for English in the workplace and in academia. Despite this focus, there is still concern that pupils leave school without the necessary skills. Hellekjær's (2005) study of Norwegian high-school pupils (who receive similar amounts of English input) revealed that two-thirds were unable to read sufficiently well to manage tertiary education in English. Hellekjær's (2009) follow-up study of university students determined that 30% had severe difficulties reading in English, and an additional 44% considered it much harder than reading in their first language (L1).

Part of the problem relates to attitudes towards the use of English. A large survey examining the attitudes of Swedish university students and their teachers towards reading in English for their studies revealed considerable ambivalence. While the teachers considered the incorporation of English texts an opportunity for incidental learning (Pecorari et al. 2011a), the students found it burdensome (Pecorari et al. 2011b) and refused to read the texts (Pecorari et al. 2012). Pecorari et al.'s findings indicate that Swedish school education does not prepare teenagers sufficiently well for academic study.

The above findings are worrying given that Swedish pupils fare well in international comparisons of L2 proficiency. For example, the *First European Survey of Language Competences*, conducted in 14 European Union member states, measured 14–15-year-olds' reading and listening comprehension as well as their written proficiency in the two main foreign

languages taught in each country. The results show that approximately 65% of Swedish pupils achieved CEFR level B2 in English reading comprehension and 80% for listening comprehension (European Commission 2012). Their written proficiency was not as impressive: just under 30% of pupils attained the B2 level. This, however, was still above the EU average (European Commission 2012: 41–42). This means that pupils who are above the EU average are still not sufficiently skilled to manage university studies and working life in English.

This conclusion is somewhat unexpected given that young people in Sweden are exposed to English daily (Sundqvist 2009; Sundqvist and Sylvén 2014). The Swedish Media Council reports that more than 80% of children and adolescents (ages 9–18) have access to computers, smartphones and use the Internet every day (Statens Medieråd 2019). Many of the extramural activities reported by the Media Council require the use of English, which means that many pupils in Swedish schools are practicing and developing their English skills in their free time (see also Sundqvist 2009), and their digital skills including Internet searches. Even so, Danielsson (2014) found little progression between the searching skills of first graders and high school students. The most recent ePIRLS study shows that the time spent online has increased, and yet the most recent International Computer and Information Literacy Study (ICILS) of 46,000 Grade 8 pupils spread across 14 countries found that just 2% of the pupils were capable of evaluating the contents of a website while 18% failed to reach even the lowest CIL level (IEA 2019). The main finding reported was that ‘young people do not develop sophisticated digital skills just by growing up using digital devices’ (IEA 2019): they need explicit instruction. We hope that our account of real classroom life below will begin to clarify the enormity of the task.

2.2 L2 English vocabularies: size and depth

Several challenges facing L2 English teachers trying to teach online searching relate to vocabulary. Whereas materials specifically designed for the purpose of teaching English can ensure that new vocabulary is appropriate, presented in a comprehensible context, and recycled (although see Norberg and Nordlund 2018 for evidence that textbooks are not as successful as one might hope), Internet texts found using the pupils’ own searches cannot be controlled. As a result, determining what vocabulary might be needed as search terms, even when the teacher has determined

the topic, is challenging. Determining whether the terms will lead to suitable sites is impossible. Nonetheless searching online *must* become part of English classes in Sweden in order to prepare pupils for higher education and working life. In this study, we consider ‘suitable’ sites to be those that have a vocabulary density at a level whereby pupils can read without becoming too frustrated.

Vocabulary knowledge is generally understood in relation to *size* (how many words an individual knows) and *depth* (how well they know the words). Vocabulary Size Tests (VST), following Nation and Beglar (2007), calculate the receptive knowledge of word families, that is, a head word plus inflected forms and derived words. For example, COOK includes the inflections *cooks*, *cooked* and *cooking* as well as derived words such as *cookery* and *overcooked*. The VST test provides the word to be tested, a sentence in which the word is used without clarifying its meaning and four definitions from which the subject should select the best. The words are selected from frequency bands which are based on the rank order of words in large corpora. The idea is that people who recognize the meanings of all the words that appear in the sixth band will know at least 6,000 word families receptively.

Using data from the *British National Corpus*, Nation (2006) has determined that a receptive vocabulary of 8–9,000 word families is needed to be able to understand most written texts (6–7,000 for spoken language). However, Schmitt and Schmitt (2014) have identified a shift that takes place at the 6–9,000 word frequency point. They note that, up until the 6,000 word limit, it makes sense to teach the most frequent words in English (as determined from large corpora). However, in the 6–9,000 bands, the additional words should be domain specific. The educational implication is that L2 English education should focus on ensuring that all pupils know the most common 6,000 word families well and thereafter take a more pragmatic approach, focusing on domain-specific vocabulary (e.g., legal, medical or historical terminology) and academic vocabulary for those who intend to study at university. This conclusion is confirmed by Hellekjær (2009), who found that Norwegian high-school pupils lacked the academic English vocabulary needed for university studies.

The VST is an accurate predictor of reading comprehension (Henriksen 2006; Henriksen, Albrechtsen and Haastrup 2004). In Denmark, Henriksen and colleagues confirmed that small vocabularies accurately predicted poor reading skills and vice versa. However, in the

mid-range, other variables, such as the capacity to infer word-meaning from context and familiarity with text structure, needed to be considered when predicting reading performance. In contrast, Stæhr's (2008) study of Danish secondary-school pupils found that a vocabulary of only 2,000 English words was sufficient for reading. In Norway, Brevik, Olsen and Hellekjær (2016) showed that teenagers' L1 reading skills contributed significantly to the development of proficient L2 reading.

Our own surveys of 206 Swedish pupils in school year 8 ($n = 40$; aged 15 years) and high school ($n = 166$; aged 16–18 years), for example, report mean VST scores of 6,225 and 8,114, respectively, corresponding to an approximate vocabulary size of the most common 6–8,000 word families. The Swedish pupils are in the mid-range where global reading skills can enable learners to overcome a lack of vocabulary, but well above the 2,000 word-level identified by Stæhr as the threshold for successful reading.

While measurements of vocabulary size are operationalized in a way that accesses receptive knowledge, measurements of vocabulary *depth* are typically also concerned with productive knowledge. Nation (2013: 49ff.) has identified nine components of word knowledge, including knowing the most common collocations, the morphology and variations in word form. He suggests that such knowledge is gradually acquired with repeated exposure to a particular word in a range of contexts.

The relationship between vocabulary size and depth reveals that in the initial stages of L2 acquisition, breadth and depth seem to be distinct entities, but they converge as vocabulary increases: readers with larger vocabularies also seem to know the words better or 'deeper' (Meara 1996; Read 1993). Pupils with small vocabularies do not always recognise when a common word (e.g., *family*) is being used in one of its less frequent senses (e.g., to describe a species: 'dog family'). Learners with larger vocabularies will not necessarily know all the meanings of a word, but they will be better placed to recognise when a word is not being used in its common sense (Logan and Kieffer 2017).

So far, we have discussed vocabulary in terms of L2 English knowledge as this is the focus of our study. However, two recent studies of Swedish adolescents also demonstrate a lack of L1 vocabulary knowledge. A study of 900,000 answers in the national university aptitude test, between 2000 and 2011 revealed that difficulties understanding words commonly used in newspapers and in public dialogue are widespread (Lindberg 2017). Gustafsson and Håkansson (2017) found that words of

Germanic origin were particularly problematic, and that literary language caused significant difficulty. Both studies suggest that changes in the way people read resulting from digitization are contributing factors. This conclusion is supported by Danielsson (2020) who found that over the period 2012–2018, the time teenagers spent online was deducted from activities such as reading books. The ePIRLS (IEA 2016) report also notes a decline in reading and increasingly negative attitudes towards reading among Swedish pupils. However, they also found that pupils were more confident about their skills than pupils in other countries.

2.3 Vocabulary learning

Even though a reduction in L1 reading has led to a decline in L1 vocabularies, L2 reading undoubtedly offers opportunities for learning new words. Just as importantly, reading enables people to learn shades of meaning and how individual words collocate and so increase the depth of their word knowledge. However, as Paribakht and Wesche point out, such learning is dependent on a broad range of issues:

successful incidental vocabulary learning through reading depends on the presence of a number of factors. Learners must attend to new words, and clear cues to their meanings and relationships must be present. Other text features, such as redundant presentation of given words and the learners' previous knowledge (such as partial knowledge of the word, of similar words or cognates), also play a role. The kinds of words to be learned and the clarity of their reference influence the ease of learning as well. (Paribakht and Wesche 1997: 177)

These issues have led some researchers to reject the term 'incidental learning'. Elgort et al. (2018), for instance, use the term 'contextual learning' as their eye-tracking study of Dutch speakers reading in English showed distinctive noticing behaviour (e.g., pausing, back-tracking) when confronted with an unfamiliar term. That is, the behaviour was not 'incidental' but *deliberate*. In our study, we were interested in the retention of words encountered when reading and then used in an essay; again, not an 'incidental' process.

One further finding that is relevant to our study is that learners tend not to learn new words if the context is easily comprehensible. When the surrounding context clarifies the meaning, learners fail to notice and thus do not learn these new words (Horst, Cobb and Meara 1998; Mondria and Boer 1991). The likelihood of this happening is measured using a

vocabulary density scale, which provides the ratio between the total number of words in the document and the number of unique words. A high ratio indicates that the text is complex as it uses many unique words; a low ratio indicates a simpler text as many of the words are recycled within the text. No ideal ratios for vocabulary learning from reading have been established, but the aforementioned studies indicate that neither extreme is desirable. Another way of measuring the complexity of texts is lexical coverage, which measures the unique vocabulary in the text in relation to word frequency scores obtained from large corpora. This was the measure used in our study (see also section 3.2) as it coheres better with the information gained from the pupils' VST scores, which are also based on word frequency scores. Since the pupils found their own texts, their willingness to challenge themselves could be inferred from these measures, complemented by an attitude test. Throughout this paper, 'text' refers to the written sections of the websites that pupils visited. Their retention and use of unusual vocabulary was used as a measure of vocabulary learning from their online reading.

2.4 Attitudes towards online searching and reading

Marc Prensky (2001) coined the term 'digital natives' to describe the generation born after 1985, who had grown up surrounded by digital technology. This generation's teachers and parents were dubbed 'digital immigrants', thereby providing metaphors for the belief that young people are more tech-savvy than the previous generation. Oddly, this belief continues, even though pre-teens struggle with basic skills including selecting appropriate search terms, feeding them into search engines, scrolling through the results, selecting links which are likely to answer their question, assessing trustworthiness, and staying focused on a lengthy text (Castek et al. 2015; Coiro 2003; Goldman et al. 2012). Andersson (2017) found that Swedish pupils do not improve their searching skills much during the course of compulsory education.

The belief that young people are tech-savvy appears to be based on a combination of self-efficacy and interest (Ofcom 2014). However, as the ICILS study confirmed, hours spent playing games or surfing social media do not contribute directly to improving young people's basic computer literacy abilities such as finding, reading, comprehending, evaluating and synthesising information available online (IEA 2019). These skills need explicit training and practice. How confidence gained from digital

pastimes impacts on searching activities is under-researched. Self-efficacy certainly contributes to all aspects of learning (Coiro et al. 2008: 13), but how attitudes affect digital proficiency is unclear.

Coiro (2012: 645) called for better tools for measuring attitudes to inform teaching practice. The SORAB (*Survey of Online Reading Attitudes and Behaviours*) scale developed by Putman (2014) is one such tool, and was adopted in this study. Putman's SORAB consists of 71 statements relating to five affective factors: cognitive and behavioural engagement, self-regulatory behaviour, anxiety, value/interest (of/in task) and self-efficacy. The latter comprises fourteen items related to efficacy for online reading (e.g., 'I feel confident that I can easily understand information I research on the Internet') and eleven items related to efficacy for online reading skill implementation (e.g., 'I am confident I can make a prediction about where a website link might lead if I click on it'). SORAB has been tested to show strong correlates with other standardised measurements of attitude (Putman 2014), although some cultural differences may exist (Putman, Wang and Ki 2015).

Attitudes are usually resistant to change, and this includes attitudes towards online searching and reading. A two-year intervention related to information literacy skills in Finnish secondary schools produced some changes in behavioural intention, but had no impact on the pupils' attitudes and self-efficacy (Alamettälä and Sormunen 2021; Alamettälä, Sormunen and Hossain 2018). This led the researchers to propose that self-efficacy should be considered a separate learning goal. We, however, suggest that it is premature to assume a simple cause-effect relationship between self-efficacy and success. While some degree of self-confidence (and corresponding lack of anxiety) is undoubtedly necessary, ungrounded self-confidence may have negative consequences. If pupils believe they are better at searching than they actually are, they will not recognise their need to improve. If their teachers believe the digital native myth, then they will not provide the training needed, nor will pupils recognise how much more they could achieve. This somewhat counter-intuitive proposal was investigated in this study.

3. The study

3.1 Participants

This study is part of a larger, on-going project investigating Swedish adolescents' advanced literacies in English. The participants of the present

study comprise pupils from three high-school classes ($n = 55$; representing English 5, 6 and 7). The pupils took the VST at the beginning of the school year and the SORAB at the end. The lessons were part of the pupils' normal classes and not optional, but data was only collected from volunteers within each class.

Since all the participants were at least 15 years of age, they were deemed capable of informed consent (SFS 2003:460). We did not seek permission to share their data through open-science platforms because (i) the pupils were minors, and (ii) the participants could identify their classmates. The findings have been presented to both the teachers and pupils orally.

Seventeen pupils did not hand in their written assignment and a further seven did not participate in the VST, despite numerous follow-ups. As a result, we can report on only thirty-one datasets collected initially. Due to the pandemic and online teaching, datasets collected later were reduced to twenty-three. The numbers are thus too low to allow for generalization. However, they do suggest that refusal to participate in compulsory school activities is widespread, which undoubtedly affects overall learning outcomes. The findings presented below reflect the skills of diligent pupils during COVID-19.

3.2 Methods and datasets

All the datasets were collected within a research project designed as a collaboration between teacher-researchers in two universities and three schools. Regular monthly meetings were held to establish where pupils were experiencing difficulties, the design of classroom activities and to discuss the datasets as they emerged. The datasets are presented below in the order in which they were collected.

Dataset 1: Vocabulary Size Test (VST)

The first dataset to be collected was the Vocabulary Size Test (VST). The VST scores were returned to the teachers and pupils within a week of completion, along with an explanation of what the scores meant in terms of proficiency. The immediate feedback was intended to set realistic expectations concerning performance for everyone involved.

Dataset 2: Classroom task

The teacher-researchers selected topics that simultaneously fulfilled the curricular requirements and enabled the collection of data. The pupils were introduced to the topics listed in Table 1. They were then given time to search online for information which they should use in an essay. They were told to search in English and how to think about search terms, but were not given specific words to use, nor were they advised on the use of advanced search functions. The teachers claimed that the level of input was ‘normal’.

Table 1. Description of written assignments

Class	<i>n</i>	Search topic	Essay genre
English 5	12	An important historical person OR School shootings in the US	Summary-Evaluation
English 6	6	Contemporary and ‘classical’ love couples	Comparative
English 7	13	Abortion rights in the US OR Gun control in the US	Argumentative

As the topics show, the pupils had some degree of freedom to choose topics that interested them.

The lessons were observed by teacher-researchers, who wrote field notes concerning the pupils’ actions and comments while searching and synthesising. Whilst many of the pupils worked hard and seemed to enjoy the task, none of them claimed to be working on a topic they read about in their free time. The pupils rated the websites they had visited as *very useful/useful/not useful*, and submitted this information along with their essay. The teachers were interviewed about their task design and the pupils’ ability to complete the task.

Dataset 3: Lexical coverage figures

The texts from all the webpages visited, as indicated by the pupils' own documentation, were run through the Compleat Web VP¹ (Cobb n.d.) to establish at what frequency bands 95% and 98% lexical coverage, respectively, was reached. These measures compare well with what could be expected from the pupils based on their collective VST-score means.

Dataset 4: Individualised Vocabulary Knowledge Scale (VKS)

In order to determine how well pupils learned and retained vocabulary encountered online, volunteer pupils participated in an individualised test of five of the words from above the 98% text coverage for the websites they used in their written assignment approximately four months after the activity took place. The test items were selected from their essays and were measured using the Vocabulary Knowledge Scale (VKS; Paribakht and Wesche 1997). This test asks pupils to self-report their recollection of the words on different levels:

- I. I don't remember having seen this word before. (0 points)
- II. I have seen this word before, but I don't know what it means. (1 point)
- III. I have seen this word before and I think it means: (Write a translation, synonym or explanation). (2 points)
- IV. I know this word. It means: (Write a translation, synonym or explanation). (3 points)
- V. I can use this word in a sentence: (Write a sentence. If you do V, please also do IV.) (4 points)

The scoring is dependent on the examples given. Pupils who, for example, self-reported level-V knowledge would still receive only 1 point if they failed to provide evidence of the knowledge required for 2 and 3 points as well. Of the 85 attempts to produce a level-V sentence, only four resulted in 1 point, with another eight receiving 2 or 3 points. These findings

¹ www.lextutor.ca. Frequency bands in the Compleat Web VP have been calculated based on word frequencies in two large corpora: *Corpus of Contemporary American English* and *British National Corpus*. Each frequency band contains 1,000 word families and they are labelled K1 (the first most frequent 1,000), K2 (the second most frequent 1,000) and so on.

indicate that the pupils' perceptions of their vocabulary knowledge were fairly accurate.

Dataset 5: Survey of Online Reading Attitudes and Behaviours (SORAB) Putman's (2014) SORAB test was translated into Swedish, divided into two parts and administered during different classes to reduce respondent fatigue. We focused on the findings related to self-efficacy.

4. Results and discussion

In what follows, we combine the results and discussion in response to each of the research questions (RQs).

RQ1: How does the vocabulary size of the participating pupils relate to the vocabulary density of the English texts they find on the Internet?

The pupils reached VST scores between 2,700 and 11,200 clustered in three distinct vocabulary size groups, here labelled as low, medium and high, as presented in Table 2. All three groups contain pupils from English 5, 6 and 7.

Table 2. VST scores in vocabulary knowledge groups

Group	<i>n</i>	Min	Max	Mean	SD
Low	10	2,700	7,400	6,390	1293.41
Medium	10	7,600	9,400	8,490	675.94
High	11	9,500	11,200	10,436	618.32

The mean scores look promising. More than half the pupils are above the 9,000-word threshold needed to read diverse texts. Although there was one outlier with a very low vocabulary, the mean score is still well above the 6,000-word threshold needed for general communication (Schmitt et al. 2017). Although the outlier in the low-vocabulary group would be expected to struggle to understand most of the texts needed to complete assignments, even the average pupils in this group should be able to manage the set tasks.

The VST scores indicate *potential* ability. The teacher-researchers wanted to know whether pupils could find trustworthy sources written at or slightly above their comfort level (measured by comparing their VST with the texts' vocabulary density) as this is the level that promotes learning. For the pupils, however, suitable sources were those that enabled

them to write an essay on a topic chosen by their teacher. We will return to this contrast shortly.

A further point to note about the VST scores is that high-frequency words (e.g., *get*) are generally low in information, which means that low-frequency words (e.g., *gestation*) carry most of the semantic burden (Carter 1998). That is, the most important information in the text may require unusual vocabulary. The context in which unusual vocabulary is encountered will affect whether or not readers pay attention, recognise and consequently learn vocabulary from reading (e.g., Horst, Cobb and Meara 1998; Mondria and Boer 1991). For this purpose, the vocabulary density of the texts that the pupils read online was evaluated using the Compleat Web VP to establish the frequency bands needed for 95% and 98% text coverage. Table 3 shows that, based on their receptive VST scores, the pupils should not have experienced major problems understanding the content of the source texts they accessed.

Table 3. Pupils' mean VST scores in relation to the lexical coverage of the source texts used at the 95% and 98% levels

Group	VST mean	95% coverage	98% coverage
Low	6,390	K3	K6
Medium	8,490	K3	K7
High	10,436	K3	K7

The source texts selected by the pupils generally reached 95% at K3 and 98% at K7. This indicates that the pupils were successfully locating texts at a level they should be able to comprehend. A more negative interpretation of the data is that the pupils were not pushing themselves to find challenging texts, but rather settling for easily-located information. This interpretation is supported by the fact that data for two pupils in the low VST group had to be excluded because they only used Swedish sources, despite explicit instructions to search in English. Their non-compliance indicates an unwillingness to push themselves.

As noted above, the pupils were told what kind of information they should look for and what kind of text they should write. The teacher-researchers' tasks required pupils to combine skimming through the search results with concentrated reading and fact checking. They were explicitly instructed on how to form a search question and select search terms, but given less explicit instruction on how to deal with the search results. Although many of the participants were ambitious, their commitment and

interest in the topic were probably not as high as would have been the case had they chosen their own topic. This may explain why they did not push themselves to read linguistically-demanding texts.

Furthermore, most of the topics related to the cultural content of the respective courses. Understanding the cultural significance of the material depends on more than vocabulary knowledge. For instance, topics such as gun control and abortion are highly contentious in the American context the pupils were supposed to examine, but much less contentious in the Swedish context. One might anticipate that pupils would not recognize quite how extreme the views in the US might be, which would lead them to poorer fact checking.

RQ2: How well did the participating pupils use and recall unusual vocabulary evident in their online reading?

To examine whether the pupils' vocabulary expanded following online reading, we first examined the texts produced by the pupils for evidence that they could use unusual vocabulary from the source texts in their own writing. Table 4 shows that the pupils' texts as well as source texts reach a 95% text coverage at the K3 level, that is, they make use of the 3,000 most frequent words in English. Because two pupils in the low-vocabulary group only provided Swedish source texts, they have been excluded from the analysis ($n = 29$).

Table 4. Average lexical coverage of pupils' own texts and of source texts

Group	<i>n</i>	95% coverage		98% coverage	
		Pupil texts	Source texts	Pupil texts	Source texts
Low	8	K3	K3	K4	K6
Medium	10	K3	K3	K6	K7
High	11	K3	K3	K5	K7

As can be seen in the column for 98% text coverage, pupils used less unusual vocabulary in their texts than the source texts. Note also that texts written by medium-vocabulary pupils reach 98% coverage at a higher frequency band than texts produced by pupils in the high-vocabulary group. This is because one pupil used a few words from the K12 and K15 frequency bands (*holocaust, typhus*). If this outlier is removed from the analysis, the mean 98% coverage is K5 also for medium-vocabulary pupils' texts. Although the number of participants is low, the trends are

very clear: pupils are selecting easy-to-read texts, and using few unusual words in their writing. Similar findings for Danish teenagers have been reported (Henriksen and Danelund 2015).

Approximately four months after they submitted their written assignments, the pupils' long-term recall of unusual words featured in their texts was tested. Each student took an individual VKS based on their writing. Some words appeared in several tests (e.g., *marrow* in essays on Marie Curie). Words with Swedish cognates (e.g., *iceberg*) and words from social media (e.g., *tweet*) were excluded. The fieldnotes indicate that pupils did not choose topics they were particularly interested in, so there was no reason to believe they knew the words before the class. The VKS was conducted during the COVID-19 pandemic, and so the pupils took the test online from home, which reduced the total to just 23 pupils ($n = 23$). Table 5 presents the pupils' VKS scores.

Table 5. VKS scores for words in pupils' texts above the 98% coverage frequency band (maximum score = 20)

Group	<i>n</i>	Min	Max	Mean	SD
Low	6	12	18	14.67	2.29
Medium	8	7	20	14.69	4.46
High	9	12	20	17.17	2.49

The mean scores indicate that contextual vocabulary learning was widespread. Approximately one-third ($n = 8$) of the pupils scored 18 points or higher. The mean score is almost identical for the low- and medium-vocabulary groups (14.67 and 14.69, respectively), whereas it is slightly higher (17.17) for the high-vocabulary group. The number of participants was low, but nevertheless suggests that the pupils could recall words they had read online and used in their texts.

RQ3: How did the participating pupils' beliefs about their abilities reflect their performance level?

So far, the data indicates that even pupils with large vocabularies avoided unusual vocabulary in their own writing. The data does not allow us to determine *why* pupils wanted to play it safe. Henriksen and Danelund (2015) found a similar reliance on high-frequency vocabulary in the writing of highly proficient Danish teenagers. They attributed this pattern to the lack of testing in Denmark, which cannot explain the Swedish results. In search of another explanation, we tested the participants'

confidence in their searching abilities using the self-efficacy measures in the SORAB questionnaire. By comparing the SORAB findings with the VST scores, we investigated whether pupils with small vocabularies also had low self-confidence and vice versa.

The SORAB test was divided into two parts to reduce respondent fatigue. Unfortunately, this meant that not all the pupils completed the entire test, making the numbers too low for statistical tests of significance. As can be seen from Table 6, pupils are, regardless of vocabulary level, quite confident about their abilities.

Table 6. SORAB scores in vocabulary knowledge groups (low confidence = 1, high confidence = 4)

Group	<i>n</i>	Part 1	<i>n</i>	Both parts
Low	8	3.0	4	3.1
Medium	7	3.2	3	3.4
High	8	3.3	5	3.2

The numbers are too low to allow us to form very clear conclusions, but it does seem that pupils have an inflated perception of their abilities. In response to the question about how confident they felt about their ability to ‘combine information from more than one website in a way that makes sense to other people’, 91% of the pupils answered that they either felt ‘very confident’ or ‘confident’. They were able to simplify the texts they found on the web, which may justify their confidence. However, their high level of confidence is at odds with their decidedly modest abilities in terms of finding suitable texts and using new vocabulary.

In line with Alamettälä et al.’s (2018) finding that self-efficacy does not change easily, there were no signs of developing confidence. The mean scores for each of the classes were as follows: English 5 (mean = 3.4), English 6 (mean = 3.6), English 7 (mean = 3.1). All scores above 2 indicate that the pupils had selected either ‘fairly confident’ or ‘very confident’. What the mean scores hide is that only two pupils had overall scores that were below three: one pupil in English 5 had a score of 2.8 and one pupil in English 6 had a score of 2.6. So even pupils with the lowest scores selected confidence slightly more frequently than lack thereof.

5. Implications for L2 English education

This study has endeavoured to examine the connections between vocabulary knowledge, self-efficacy and online searching. The low participant numbers do not allow us to generalise to the wider population; however, we do consider the high level of non-compliance to be an important finding in itself. We began the study with 55 volunteers, that is, pupils who actively indicated a willingness to participate. Less than half ($n = 23$) completed all the tasks, even though these were part of their ordinary school assignments. COVID-19 is one explanatory element, but cannot account for everything. If pupils refuse to participate in activities designed to promote their learning, we should not be surprised that so many pupils leave school poorly equipped for further education and working life.

The most important result comes from the SORAB test which revealed that the pupils were very confident in their searching abilities. Whilst this finding was in line with Danielsson (2014), the teachers of our pupils had not anticipated this. During a focus group discussion about the SORAB test, the teachers were all strongly in agreement that the pupils lacked both ability and confidence. The teachers² described their pupils as exhibiting dependency behaviours, frequently asking for help: ‘They tend to ask before they search, and they tend to surf rather than looking for information’ (Irja). Eva described a pupil who was supposed to write an assignment on Martin Luther King asking ‘How am I supposed to find out about that?’. She needed to be directed to use the Internet as a source of information. The teachers noted a lack of confidence and ability in relation to Word, Excel and other basic tools, but acknowledged that the pupils were confident with their phones: ‘I think that they are more up to date with the latest apps’ (Eva) and ‘they are good with filters’ (Elin).

The mismatch between the pupils’ self-reported high levels of confidence and their teachers’ experiences poses a major pedagogical challenge. The ePIRLS finding that Swedish pupils read less than pupils in most OECD countries, but have higher confidence, indicates that the problem is not isolated to the pupils we studied. Eva and Elin are both young teachers born after the 1985-threshold for ‘digital natives’. One of the other points they made was that because digital technology was new when they were in school, they had been given explicit courses on how to use Word, Excel and so on, whereas the teenagers they teach are assumed

² The teacher names are pseudonyms.

to possess such skills. This excellent observation suggests that explicit courses on how to use digital media are sorely needed, ideally in early secondary school.

The second main finding comes from comparing the pupils' vocabulary size (i.e., their potential) with the vocabulary density of the texts they read and those they wrote themselves. With a few exceptions, the pupils' vocabulary sizes were sufficient for understanding and producing reasonably complex written texts. However, both the texts the pupils located and those they produced were noticeably below their achievement levels indicated by their vocabulary size. A simple way to dismiss this finding would be to conclude that the pupils were being 'lazy' or simply settling for the first piece of information they found. But these conclusions were not supported by the teachers' observations. Lilly described the pupils as never feeling satisfied with their searches, noting that she had to restrict the time spent searching or they would 'take an entire semester for one assignment'. Returning to Irja's point that the pupils were surfing rather than searching, the pupils appear to have problems defining what kinds of information they hope to gain from searches. They can run a dirty search, but rarely refine searches thereafter. Several of the questions in the SORAB self-efficacy measures dealt explicitly with such skills and revealed considerable discrepancies between the pupils' self-evaluated abilities and their performance.

The final aspect investigated in this study relates to learning vocabulary by reading. Here the outcome is far more encouraging. Pupils not only managed to use very unusual vocabulary in their own writing, but also could recall most words four months later. This suggests that time spent searching online during English classes is valuable, even though the teachers felt it was not efficient. School leavers need to be better equipped to manage searching than they currently are, but this has not been recognised in the number of hours of teaching allocated to English. Given the importance of English online, this topic needs to be addressed at both the classroom and policy levels.

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