

Lexical Coverage in Bangladeshi EFL Textbooks: A Corpus-Based Study

by

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Abstract

Textbooks are a crucial tool in English as a foreign language (EFL) contexts where out-of-the-classroom use of English is minimal. Vocabulary is an essential component of language learning; thus, EFL textbooks should sufficiently represent vocabulary needed for students' academic success. Due to the growing demand for English proficiency locally and internationally, Bangladeshi EFL textbooks' lexical coverage is examined to determine if vocabulary input is aiding students in their K-12 education and their transition to higher education. A corpus-based analysis of the Bangladeshi K-12 textbooks' vocabulary has been conducted, and the vocabulary of university textbooks is compared to the K-12 vocabulary. Results demonstrate that the transitions to academic stages are not easy, as the lexical input found in early-grade textbooks leaves significant gaps in vocabulary found in textbooks of the later grades, and similar results were found in the transition to tertiary levels. Pedagogical implications and recommendations are also discussed.

Keywords: textbooks, vocabulary, English as a foreign language, corpus-based analysis, Bangladesh

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Chapter 1: Introduction

1.1 Background and Context

Textbooks play a significant role in pedagogical practice worldwide and are the most powerful resource for the teachers to transfer target concepts to their students (Littlejohn, 1998; Simon & Garcia-Belmar, 2016). Additionally, textbooks can motivate both teachers and learners to teach and learn effectively. Teachers from elementary to tertiary levels around the world use textbooks since textbooks offer a package of materials, themes, topics, and assessment tools. These components make teaching easier for the teachers (Brantlinger, 2006). Moreover, a textbook, whether in print or digital form, can influence learners' motivation (Woody, et al., 2010). During educational change or innovation, textbooks play vital roles by enabling the visualization of future changes, providing training to teachers and students, and giving teachers confidence (Hutchinson & Torres, 1994). Among all other subject-based textbooks, language textbooks are in great demand (Williams, 1983).

Textbooks are essential in many English language learning contexts. English language textbooks can enhance incidental language learning (Pecorari et al., 2011). Furthermore, textbooks are at the heart of many English language teaching programs, and textbooks can provide lesson content, practice materials and exposure to the target language (Matsuda, 2002; Richards, 2001; Sheldon, 1988; Tomlinson, 2002). English as foreign language (EFL) contexts have the lowest opportunity for English language exposure among different educational contexts, since in EFL contexts, English is not practiced in society; instead, classroom input is usually the sole source of input. In EFL contexts, textbooks provide teachers and students with helpful teaching and learning

materials (Charalambous, 2011). Textbooks bring many benefits in language learning contexts; however, the positive aspects of textbooks can be realized only if the textbooks meet the broader curriculum goals, support the learning process, and most importantly, fulfill learners' needs. Selecting a suitable textbook for learners is a significant challenge since a textbook must maintain a high quality and be useful and appropriate for a given context and students (Fredriksson & Olsson, 2006; Tok, 2010). It is essential to choose appropriate textbooks since teachers spend a considerable amount of time using textbooks in the classroom. It is reported that foreign language public school teachers typically use textbooks as the default material for classroom use (DESI-Konsortium, 2008; Limberg, 2016). Therefore, in EFL contexts, as there is no English language input outside the classroom, selecting suitable textbooks is a must to properly introduce the target language to the learners.

One of the critical elements that textbook and materials writers need to be aware of is how recent research in vocabulary testing, lexical-based text-analysis have allowed advances in vocabulary pedagogy (Schmitt, 2008). A considerable amount of vocabulary knowledge is needed to communicate in a wide variety of circumstances on a range of topics. Since the absence of vocabulary knowledge causes breaks in communication, teachers and students understand the importance of learning vocabulary, and students are well aware that they need to learn sufficient vocabulary (Mediha & Enisa, 2014). Learning vocabulary might not always be pleasant since vocabulary learning is reported to be one of the most challenging, tedious, and time-consuming tasks for teachers and students in a language class (Croll, 1971). Since EFL learners receive a limited amount of lexical input throughout their formal education, vocabulary acquisition should be emphasized more in

EFL contexts (Hunt & Beglar, 2005). However, despite recognizing the importance of vocabulary, in many cases, textbooks fail to address the proper selection and presentation of necessary vocabulary (Alsaif & Milton, 2012).

As mentioned previously, since textbooks are the most common and widely used teaching and learning material, vocabulary in the textbooks needs to be presented systematically so that the learners can receive enough input and exposure to learn the target language. One thing that needs to be remembered in a foreign language classroom is that the students can easily become frustrated by too many unknown words (Lipinski, 2010). Therefore, the number of unknown and target lexical items in the text of a textbook needs to be carefully considered. However, what is the minimum of lexical features of texts that allow learners to read and comprehend them? A fixed answer to this question for all learners and all contexts cannot be given. At times, one word in a text can inhibit a learner from grasping the meaning of the text. This particular problem could occur if that word is essential to comprehension of the text. On the other hand, learners might face difficulties if a text is full of technical words (e.g., scientific words) or even other general English words. However, learners can guess the meaning of a word in a given context if they understand other surrounding words in the text. The words around an unknown word can provide hints about the unknown word.

However, what if the words that surround unknown words are also unknown to the learners? There would be no way for the learners to infer the meaning of that word in that circumstance. One available option for learners is to use a dictionary to discern the meaning of unknown words. However, this poses a challenge, as reading would just become a task of decoding a text where much of the language is unknown. Therefore,

level-appropriate texts need to be handed out to the students so that they can read the texts with little or no support. Over time this would make reading meaningful for the students and would provide the minimum criteria needed to make the text enjoyable.

In addition to addressing the issue of difficulty and number of lexical items in a text, strategic materials design should also consider whether words that are presented in one course would be expected to be known by students that proceed to the next course (i.e., whether these words would be required prerequisite knowing for proceeding courses). Is encountering a word one time in a previous text enough for a learner to know the word well enough to be able to understand it in a future reading text? If not, how many times would a word need to be seen before being internalized? Additionally, how would the qualitative aspects of how a word is presented and interacted with increase the chances of it being internalized? Every learner has their own pace of learning, and it would be impossible to measure the quality of exposure for every word in every individual. Some words can be memorized in one encounter, while other words require numerous encounters to transfer into the long-term memory (Webb, 2007).

Researchers have examined the number of lexical items and the number of exposures necessary to learn new words and have identified valuable statistics. In the case of the number of acceptable unknown words in a text, researchers agree that if readers do not know one in 50 words (2%), it is acceptable for them to guess the meaning of the words from the context while also stating that 5% of unknown words in a text can be managed with support from other sources (e.g., teachers, dictionary) (Hu & Nation, 2000; Laufer, 1989; Nation, 2001; Schmitt et al., 2011; West, 1926). However, anything below the threshold of 95% would be too difficult for the students and teachers to manage. In

terms of the number of exposures required to learn new words, many researchers (Elgort & Warren, 2014; Nation & Wang, 1999; Pellicer-Sánchez & Schmitt, 2010; Pigada & Schmitt, 2006; Webb, 2007) agreed that around 10 encounters of a word are required to learn a word incidentally while three to five encounters can put pace on reading (Pellicer-Sánchez, 2016). Manually counting words in longer books or groups of textbooks is a laborious task as those texts can contain thousands of words. It can take a tremendous amount of time for researchers review each word in more extensive texts. However, corpora and corpus tools have made the measurement of word counting and investigation easier. In definition, a corpus is a collection of selected texts used to measure vocabulary or grammar items in texts (Nation, 2001).

However, are the English textbooks providing enough words and exposure to the students where the textbook is the sole source of input for English language learners (e.g., EFL contexts)? To explore this question, it is essential to examine the importance of the amount and exposure of lexical items in EFL textbooks in order to make the formal education journey easier for the learners. Otherwise, learners might become frustrated and demotivated, and they could do worse in their academic carrier due to inadequate vocabulary knowledge. As an EFL learner, I felt the need to have decent word knowledge while struggling in my undergraduate program. I invested much time in consulting dictionaries to get the meaning of the words to understand university texts. Moreover, while I was teaching in the K-12 system in an EFL context as a secondary school teacher, I realized more about students' struggle with English. In Bangladesh, passing in English is a major goal for both institutions and learners.

In many EFL contexts, English textbooks are obtained from international publishing companies for use in the classroom (Chujo, 2004; Hsu, 2009; Maysuoka & Hirsh, 2010; O'Loughlin, 2012; Yang & Coxhead, 2020). However, in some contexts, textbooks are generated by that country's government (Alsaif & Milton, 2012; Nguyen, 2020; Sun & Dung, 2020). Bangladesh is one of the EFL contexts where textbooks are designed and published by the government, specifically the National Curriculum and Textbook Board (NCTB). Furthermore, textbooks are often published according to textbook writers' intuition, rather than according to research (Biber & Reppen, 2002). There have been numerous studies conducted in Bangladesh that have addressed the textbook problem from a cultural or broader curricular perspective (Ali, 2017; Naznin & Hassan, 2016). Moreover, there was research about the Bangladeshi testing system and medium of instruction in Bangladesh (Naznin & Hassan, 2016; Rouf, 2012; Siddiqua, 2016; Sultana, 2018, 2019). A few studies also studied vocabulary through questionnaires, mainly at the university level (Afrin, 2016; Jahan & Jahan, 2011). However, to date, no study has been conducted using corpus tools to address the vocabulary coverage in primary and secondary (K-12) textbooks and the transition to higher education in terms of lexical coverage. Therefore, this thesis will (1) investigate the lexical coverage of Bangladeshi EFL textbooks in different stages of K-12 education, and (2) examine how, if at all, these textbooks support students as they transition to higher education.

To measure the educational transitions, the study presented in this thesis examined four crucial transitions in the K-12 education system in Bangladesh: passing primary education (Grade 5) and moving to Grade 6, junior secondary completion (Grade 8), secondary completion (Grades 9-10), and higher secondary completion (Grades 11-12).

This study also measured the transition to tertiary education (undergraduate university education) from the Bangladeshi K-12 education system. To find the lexical coverage, textbook corpora were made and examined to determine the percentage of words covered in a target text by a group of texts. This research will add a new dimension to the vocabulary research sector in Bangladesh and other EFL contexts. The use and importance of corpus tools in applied linguistics research in EFL contexts can thus be understood more clearly. Moreover, the NCTB, material developers, education ministry, and teachers will be aware of the textbooks' present vocabulary distribution. They can take apply this research in their practice from their respective positions to aid students in becoming more successful in their academic endeavors.

1.2. Organization of the Thesis

This thesis is organized into six chapters. Chapter 1 introduces the general importance of textbooks and their use in EFL contexts, the importance of vocabulary in textbooks, key issues to consider while making decisions about textbook vocabulary, the rationale behind choosing Bangladeshi EFL textbooks, and the purpose of this study. Chapter 2 reviews existing literature pertaining to crucial topics related to this study, including the importance of vocabulary learning, the minimum threshold of word knowledge, the text-reader relationship, required encounters for word retention, textbook analysis techniques, the rationale of choosing flemma as counting unit, difficulties in the transition to academic stages, vocabulary growth, and the education system in Bangladesh. This chapter also gives an overview of the significant research gap that the study will cover. Chapter 3 introduces the research questions and outlines the research design by describing the materials used in this study, the process of creating textbook corpora, and

the analysis procedure. Chapter 4 presents the results of this study using tables and providing explanations of major findings. Chapter 5 provides a critical discussion of the results in relation to the previous literature while addressing the study's two research questions. This chapter also discusses the limitation of the research, pedagogical implications, recommendations for the betterment of textbook vocabulary, and suggestion for future research. Chapter 6 summarizes the previous chapters, thus acting as a conclusion to this thesis.

Chapter 2: Literature Review

The focus of this study is investigating texts for different levels of readers by analyzing vocabulary coverage in Bangladeshi EFL textbooks. As such, this literature review outlines previous studies that address related issues to vocabulary research. The importance of vocabulary is discussed since this study is based on single-word vocabulary. Next, the minimum coverage percentage required to understand texts will be described, followed by a review of the literature describing the importance of matching readers with texts. This topic is followed by a vital aspect of this research: an exploration of the minimum amounts of encounter/repetition needed for retaining a word and the counting units of words in this study. Next, the vocabulary growth of EFL learners is described, followed by the following two topics: why the selected textbooks were chosen for analysis and how the textbooks have been analyzed with different methods and tools. The challenges of transitioning from one educational stage to another are portrayed since this study analyzes vocabulary in different academic-life levels. Finally, Bangladesh's education system and its brief history and importance of investigating textbook vocabulary in Bangladesh are discussed in this chapter.

2.1 Importance of Vocabulary Learning

In any language, words serve as the foundation for all four language skills- listening, reading, writing, and speaking (Nation, 2011). As the number of words can be traced easily, vocabulary learning is the most rewarding and motivating among all skills (Webb & Nation, 2017). In both first language (L1) and second language (L2) contexts, learners construct a mental lexicon and map a relation between word form and meaning (Barcroft, 2015). One significant difference between L1 and L2 vocabulary acquisition is

lexical competence: knowledge of a language's vocabulary and the ability to use it (Laufer, 1998). Vocabulary acquisition is essential in every context, whether it is learners' first, second, or additional language (Decarrico, 2001). Without sufficient vocabulary knowledge, it is difficult to both understand others and to make others understand what you are communicating. When emphasizing the importance of vocabulary, Wilkins (1972) stated that without grammar, students could still convey a simple message, but without vocabulary, nothing can be communicated. Furthermore, vocabulary knowledge is one of the best methods to gauge whether or not students will understand a given text (Laufer & Sim, 1985).

Moreover, learners with a smaller vocabulary are not as proficient in different language skills as individuals with a more extensive and vigorous vocabulary knowledge (Meara, 1992). The degree of word knowledge determines how well an individual will know the aspects of a language (i.e., their communicative competence), such as morphology, syntax, phonology, and pragmatics (Biber & Conrad, 2001). Without an extensive vocabulary, learners are unable to fully use a language's structures and functions (Nunan, 1991). In both English as second language (ESL) and English as foreign language (EFL) contexts, lexical knowledge is vital for learning language skills (Nation, 2011). For example, reading and speaking skills are augmented by having an extensive vocabulary as an extensive vocabulary enhances reading comprehension and enables participation in social activities (Blachowicz & Fisher, 2004). As such, lexical knowledge is essential, especially in an L2 context (Schmitt, 2000). Lexical knowledge helps learners both inside and outside the classroom. Inside the classroom, lexical knowledge helps students participate in classroom activities and complete tasks successfully, while outside the

classroom, lexical knowledge helps students engage in vocational and social activities within their community (Graves, 2006). With proper support and opportunities, one can learn a considerable amount of vocabulary. Vocabulary knowledge or vocabulary size is not an underlying capacity; instead, it results from home language support and school instruction (Biemiller, 2011). In a teaching-learning context, vocabulary is the main component of instructional contents (Webb & Nation, 2017) and a better grade is dependent on learner word knowledge (Laufer & Goldstein, 2004). As such, children's writing products have been found to contain ample amounts of vocabulary that they have encountered and been taught in the classroom (Webb & Nation, 2017). Additionally, learners must actively engage with vocabulary as vocabulary is one of the most fundamental language test components (Schmitt, 1999).

Different learning contexts will have different vocabulary teaching and learning styles. EFL contexts are those where English is not spoken as a first language. This results in learners receiving very little input, causing learning in such environments to be challenging (Webb & Nation, 2017). Students do not usually feel the need or motivation to learn English extensively since they typically do not need to use English outside the classroom. Furthermore, classrooms should strive to achieve a balance between deliberate (explicit) learning of the vocabulary and incidental (implicit) learning since deliberate learning is time-consuming, taking up copious amounts of class time. Since time is limited in a classroom setting, and there is pressure to teach a variety of skills and tasks, teachers need to prioritize some aspects over others. Therefore, there should be an emphasis on incidental learning with a focus on meaning-focused input, meaning-focused output, and fluency development (Webb & Nation, 2017). Furthermore, Webb and Nation suggested

that, for lower-level learners, the focus should be given to building the foundation for vocabulary while the goal should be making autonomous learners for higher levels. Additionally, realistic learning goals should be implemented at all levels of learning.

The last century has seen a significant increase in vocabulary research (Nation, 2013), which has undoubtedly influenced vocabulary learning (Webb & Nation, 2017). However, there is still debate about how to optimize vocabulary learning. Vocabulary learning can happen deliberately or incidentally. Incidental vocabulary learning is learning words from reading or listening in a particular meaning-focused context, while deliberate or intentional vocabulary learning is learning words through a given list or test (Barcroft, 2015). Researchers including Krashen (1989), Nation (2001), Huckin and Coady (1999), and Hulstijn and Laufer (2001) have emphasized the importance of incidental vocabulary learning through extensive reading tasks that allow students to infer word meaning from context. The contextualization of the vocabulary allows students to process language on a deeper level and develop semantic networks that enhance learning (Ooi & Kim-Seoh, 1996). However, other researchers (Cobb, 2007; Elgort, 2011; Elgort & Nation, 2010) advocate for deliberate vocabulary learning since learners can learn more vocabulary in a shorter time frame, and deliberate learning of vocabulary leads to a greater possibility of retention. These two vocabulary teaching and learning methods are also referred to as implicit and explicit approaches to learn vocabulary (Chacón-Beltrán et al., 2010). Both approaches are productive and essential for vocabulary learning. Language programs need to be designed using both approaches (Webb & Nation, 2017).

In English language learning contexts, both the teachers and learners are keen to optimize teaching and learning; however, there is insufficient research that can be directly

applied by teachers in the classroom (Webb & Nation, 2017). Researchers have investigated different aspects of vocabulary learning and teaching using corpora, including determining what is a word (i.e., what constitutes as a single word) (Bauer & Nation, 1993; Schmitt & Zimmerman, 2002), conditions for vocabulary learning (Kim, 2008; Laufer & Hulstijn, 2001; Nation, 2001), categories of words (Chung & Nation, 2003; Hirsh & Nation, 1992; Nation, 2001), and vocabulary size (Schmitt & Schmitt, 2014). Furthermore, recent corpus-based research in written (Yoon & Hirvela, 2004), spoken (van Zeeland & Schmitt, 2013), and viewing (Rodgers & Webb, 2011) contexts has indicated a frequency-based relative value of words and identified vocabulary that should be prioritized in the classroom. Finally, one of the most critical aspects of vocabulary studies that researchers have explored is the vocabulary coverage of texts (Hirsh & Nation, 1992; Hsu, 2011; Hu & Nation, 2000; Laufer & Nordman, 1989; Nation, 2006). Knowledge regarding the vocabulary coverage of texts can inform material developers, teachers, and educators to design and select class texts that the learners can understand and comprehend.

2.2 Lexical Thresholds

Does one need to know all the word meanings of a given text to understand the entire text? Learners need to know a significant percentage (above 90%) of words to understand a text (Nurmukhamedov & Webb, 2019); however, there are differing opinions regarding the exact percentage. West (1926) claims that learners need to know 98% of the target word in a text, while Laufer (1989) claims that at least 95% lexical coverage is required for “academic reading comprehension” (as cited in Laufer, 1992, p. 127). Researchers have tried to simplify the debate about the minimum threshold and concluded that for unassisted pleasure reading, 98%-word knowledge of a text is minimum since

learners can guess the meaning of the unknown words from the context outside the classroom (Nation, 2001). In contrast, for a classroom setting, where there is additional support and guidance from the teachers, 95% is the recommended limit (Hu & Nation, 2000; Schmitt et al., 2011).

Lexical coverage and comprehension are two different concepts. The lexical coverage is the percentage of words known by readers in a given text (Nation, 2006), whereas comprehension of a text is a combination of many essential factors, including lexical knowledge (van Zeeland & Schmitt, 2013). To calculate a wordlist's coverage of a text, the number of tokens of the words in the wordlist is divided by the total number of running words in a text, and then the result is multiplied by 100 to obtain a percentage. A 95% coverage of a text does not guarantee 95% comprehension; instead, 95% coverage indicates a minimum threshold for a certain level of comprehension, and this coverage percentage may also indicate the minimum vocabulary size necessary for there to be a chance at understanding a given text (Hsu, 2011; Laufer, 1989). Minimal knowledge of 4000-5000 word-families (i.e., related words) – not including proper nouns – might have a 95% coverage in academic reading texts, while 98% coverage might require a vocabulary size of 6000-8000 word-families, not including proper nouns (Laufer & Ravenhorst-Kalovski, 2010).

Scholars have also examined the relationship between the number of required words to understand a text (vocabulary size) and the coverage percentage. For daily or casual oral communication, knowledge of at least the most frequent 2000 words in English is needed, while knowledge of a minimum of approximately 3000 words is required for learners to understand authentic oral language (Schonell, 1956). Moreover, the knowledge

of the most frequent 5000 words should enable an L2 reader to infer the meaning of novel words from the context and to understand most parts of spoken language. Successfully overcoming university education challenges in an L2 demands knowledge of around 10000 words that includes knowledge of genre-specific academic word knowledge (Schmitt et al. 2001). Knowledge of a minimum of 3000-word families is needed to get to 95% coverage of any conversation, movie, or TV program (Nation, 2006; Webb & Rodgers, 2009).

A 98%-word knowledge of a text means that, on average, the reader does not know one out of 50 words. If readers do not know one word in every 50 words, they can still infer the text's meaning by guessing the meaning from context. However, if the readers do not know 5% of the words (i.e., if they have a 95%-word coverage), it is challenging for them to read without assistance. A 95%-word coverage of a text means the learners do not know one word in every 20 words or two lines of a text (Hsu, 2011). In a classroom setting, with the teacher's help or by referencing a dictionary, students can be assisted in reading the text. Below 95%, it becomes challenging for teachers to support students in reading the text as there are many unknown words that students must know to understand the text, and it might not be possible to teach these words in class due to time and resource constraints. Furthermore, while dictionaries can be a useful tool, dependence on a dictionary can hinder reading fluency (Laufer, 2013) because overuse of a dictionary can turn reading into decoding a text. Nation (2001) also described the importance of investigating the percentage of unknown words in a text by stating that if the learners do not know at least 95% of the vocabulary in a text, meaning-focused instruction will not be possible, as students must concentrate more on language features and will be excessively

dependent on using a dictionary. Therefore, it is important that texts are appropriate for the students' level so that they can sufficiently understand the texts.

2.3 Matching Readers to Text

As readers need texts appropriate to their levels (Allington, 2005), teachers, specialists, and literary coaches need to consider learners' abilities when selecting materials. Selecting appropriate materials becomes more important for readers who are struggling with difficult texts (Atkinson et al., 2002; Biancarosa & Snow, 2004). Students do not benefit from reading difficult materials; instead, they become frustrated, leading to a decrease in their levels of motivation and self-esteem (Mesmer, 2008). A successful and pleasurable reading experience can motivate learners to read (Ozgungor & Guthrie, 2004), while a struggling learner might fail to be productive in reading (Allington, 2007).

Mesmer (2008) emphasized the importance of "reader's stages of development" (p.4): lower-level learners need alphabetic knowledge and word recognition skills, while intermediate readers' texts should be designed to improve fluency and comprehension. To facilitate students' attention and motivation, texts should be selected in a gradually challenging manner so that the texts' difficulty level increases progressively. This notion of progressive increase in difficulty also aligns with Krashen's (1989) comprehensible input hypothesis ($i+1$) and Vygotsky's (1978) Zone of Proximal Development (ZPD) and scaffolding. Krashen's (1989) comprehensible input hypothesis emphasizes providing learners with linguistic input that is just beyond the learners' existing knowledge (i.e., input that is neither too hard for the learners nor too easy). Vygotsky's (1978) ZPD refers to a "zone" within which the learners engage with new challenges, from where students

can master new skills and push through to reach new targets through the help of others (e.g., teachers, peers, parents). This help provided by others has been termed *scaffolding*.

Some students also need help in selecting their texts. For example, beginner-level learners (e.g., elementary school students) are unable to independently select materials that are appropriate for their level of proficiency (Donovan et al., 2000). If these learners receive proper guidance from their teachers (or, in the case of young learners, their parents), it can significantly impact their “educational and socio-economical outcomes” (Mesmer, 2008, p. 2). Readers who have limited language ability can become discouraged if the material is very much out of their reach (i.e., if the material is too challenging), while unsophisticated materials can also fail to make learners interested in reading (Aziz et al., 2010). English language learners need a more careful selection of texts since English texts might “contain unfamiliar words or difficult academic vocabulary” (Mesmer, 2008, p. 4). As mentioned previously, when teaching, it is important that teachers ensure their learners can recognize and understand a sufficient number of words in a text (about 95% of a text) (Mesmer, 2008). In order to recognize a word in a new text, the learners must have encountered the word beforehand. However, how many times the learners need to encounter a word to memorize the words in their long-term memory? The following section will address this question by examining the literature surrounding this topic.

2.4 Minimum Encounter Needed to Retain a Word

Since language learners only learn word meaning after encountering a word several times (Sokmen, 1992), repetition is essential for L2 incidental vocabulary learning and retention (Peters et al., 2009). A higher number of encounters leads to a higher possibility of gaining new words (Peters & Webb, 2018; Waring & Takaki, 2003; Webb, 2007; Webb & Nation, 2017). Repetition is an essential factor for learning vocabulary through reading (Eckerth & Tavakoli, 2012; Nation, 2011). Webb & Chang (2012) concluded that only one encounter of a target word is insufficient for recognizing the form and meaning of that word. There are different opinions about the number of repetitions needed for learning a new word. The lowest number was reported by Vidal (2011), who found that two to three encounters would expedite the learning process considerably. Additionally, Pellicer-Sánchez (2016), through the use of eye-tracking, found that three to four encounters of a word make reading significantly faster, and that by eight encounters, learners can internalize a word. Other studies indicated that six to eight encounters of a word in reading could ensure substantial vocabulary learning gains (Horst et al., 1998; Rott, 1999), and that at least ten encounters are needed to learn in an incidental vocabulary learning environment (Nation & Wang, 1999; Pellicer-Sánchez & Schmitt, 2010; Pigada & Schmitt, 2006; Webb, 2007). However, additional studies comment on a great number of encounters. Elgort and Warren (2014) found 12 encounters are enough for learning a new word, while Waring and Takaki (2003) claim that more than 20 encounters are needed for learning vocabulary in the L2 context. Cobb (2007) took this a step further and concluded that L2 learners are unlikely to reach the target vocabulary size (the most frequent 3000-words) by incidental vocabulary learning through reading alone.

These differing claims may be the result of different research contexts or different methodologies and approaches. Uchihara et al. (2019), in their meta-analysis of 26 studies, commented that the range of encounters might happen in both form recognition and meaning recognition of a word. Meaning recognition is more complex than form recognition, and as such, more encounters are needed for meaning recognition to be internalized. Furthermore, it has also been suggested that more encounters may be needed since there are additional elements of vocabulary learning, and not just the form-meaning connection. Vocabulary learning involves other aspects, including collocation, syntactic, word class, and association information (Pellicer-Sanchez & Schmitt, 2010; Webb, 2007 as cited in Uchihara et al., 2019). Schmitt (2008) and Laufer (2009) also echoed that vocabulary learning is a gradual process, where vocabulary knowledge increments from lower to higher over time. For a higher probability of gaining vocabulary, more frequent encounters are needed.

Another critical aspect of word repetition is the period of time needed for the repetition to be effective, as word knowledge tends to decay after a certain period. Interestingly, after encountering a word 15 times, knowledge of a word tends to diminish within three months (Waring & Takaki, 2003). Similarly, Barclay and Pellicer-Sánchez (2021) have found that considerable decay occurs over a four-week retention interval. For example, they found that 44.5% of word knowledge was forgotten after four weeks in terms of form recognition. Word repetition should be done over an extended period of time rather than in a few instances (Vidal, 2011). Baddeley (1999) suggests that initial encounters should be relatively short while late encounters should be further apart. However, earlier encounters contribute more than later encounters (Nation & Webb, 2017).

Repetition of all but the most frequent words in EFL contexts has been found to be insufficient, and in EFL textbooks, word repetition occurs infrequently (Yang & Coxhead, 2020). A popular English textbook used in EFL contexts, *New Headway*, contains one-third of low-frequency words used in only one instance throughout the entire book (Matsuoka & Hirsh, 2010). Similar results were found by Sun and Dung (2020) in Chinese high school textbooks. Since textbooks are the primary source of English language input in EFL contexts, both inside and outside the classroom, it is necessary to investigate how the vocabulary is encountered in class at various education levels and how this contributes to vocabulary learning through repetition. In this thesis, vocabulary coverage is calculated based on a varying number of encounters to evaluate K-12 textbooks in terms of the vocabulary input they offer, and the vocabulary load they present to learners in the Bangladeshi K-12 EFL context. Then, these K-12 textbook vocabulary studies will be used to examine how K-12 textbook materials help students prepare for English reading in higher education.

2.5 Why Textbooks?

Textbooks contain official knowledge and are also considered an official curriculum (Altbach, 1989; Apple & Christian-Smith, 2017). Although many drawbacks of using textbooks have been described, particularly with respect to pedagogy, psychology, linguistics, gender, sexism, and stereotyping (Allwright, 1982; Renner, 1997), using textbooks also has many benefits, including reduced lesson preparation time, cost, and increased quality of materials (O'Neill, 1982). Furthermore, textbooks can offer credibility, help in self-directed learning, present ideas, and activities, and act as a syllabus with pre-determined learning objectives (Cunningsworth, 1995; Sheldon, 1988). A textbook can

support and guide both teachers and the learners simultaneously, and it can control and determine the methods, processes, and procedures of teaching and learning (Allwright, 1982). For new learners in an introductory course, textbooks act as a basis for lectures and activities. (Carson, 2001). It has been found that students in a language class spend 90% of their class time interacting with the textbook (Young & Reigeluth, 1998). Textbooks are considered an important aspect of learning; however, it should be noted that, in some cases, textbooks could be the reason behind educational failure, and they can contain major theoretical, design-related, and practical problems (Sheldon, 1988; Swales, 1980).

In EFL contexts, textbooks have become an integral element of learning. As students do not have adequate opportunities to practice and use English outside the classroom (Hacker, 2008), textbooks are the primary source of exposure to English, and words are learned mainly from textbooks or coursebooks (Alsaif & Milton, 2012; Jordan & Gray, 2019; Macalister, 2016; Yang & Coxhead, 2020). As vocabulary learning is one of the primary goals in a language classroom (Nation, 2013), a well-designed textbook in an EFL context can enhance vocabulary learning. Although sufficient vocabulary input is, theoretically, an essential issue for textbooks, vocabulary is not considered seriously during the textbook design process (Milton, 2009). Ideally, a great deal of care is needed while planning a textbook for EFL classrooms (Alsaif & Milton, 2012; Nguyen, 2020; Sun & Dung, 2020).

It is essential to examine the type of vocabulary used in textbooks and examine whether it is too easy or too challenging for the students' level of education and proficiency (Webb & Nation, 2008). Numerous studies have tried to investigate the vocabulary load of EFL textbooks through vocabulary coverage calculation. Most recent studies reported that

the textbook inputs are insufficient for the vocabulary level of the students (Alsaif & Milton, 2012; Hsu, 2014b; Nguyen, 2020; Sun & Dung, 2020; Webb & Chang, 2012) and recommended more vocabulary input in the textbooks to make learners understand the textbook. Matsouka and Hirsh (2010) suggested introducing extensive reading in the EFL contexts to enable learning vocabulary beyond high-frequency words.

Numerous studies have been done to address vocabulary issues in EFL textbooks. However, most of the studies examined textbooks published by international publishers (Chujo, 2004; Hsu, 2009; Matsuoka & Hirsh, 2010; Yang & Coxhead, 2020). For instance, Yang and Coxhead examined New Concept English (NCE) textbook series, while Matsuoka & Hirsh looked at the New Headway Student's Book. Despite the post-colonial criticisms of internationally published English textbooks, textbooks written by native speakers for generalized contexts continue to be used throughout the EFL world (Yenika-Agbaw, 2016). Another notable issue for EFL textbook analysis is that many studies examine subject-specific textbooks written in English instead of English language learning textbooks (Sun & Dung, 2020). In Bangladesh, the K-12 textbooks for Bangla medium-of-instruction (all subject-related textbooks are in Bengali except English) and their English Versions (all subject-related textbooks are the English translation of the Bengali version) are published by the National Curriculum and Textbook Board (NCTB). This study investigates the coverage of K-12 English textbooks, and it also compares how K-12 textbook vocabulary helps students in their first-year university education. It should be noted that researchers have applied different research methods to examine different aspects of textbooks; each method is beneficial and sheds light on different characteristics of the textbook while recommending changes to improve teaching-learning practices.

2.6 Textbook Analysis Techniques

2.6.1 General Techniques

Textbooks have been evaluated over the years using different techniques. In the UNESCO Guidebook on Textbook Research and Textbook Revision, Pingel (2010) explained that textbook evaluation or research has mainly two major concerns: one is regarding the textbook's pedagogical implication, and another is the contents of the book itself. To address both concerns, Pingel stressed both the qualitative and quantitative methods of analysis as they are complimentary. As far as quantitative analysis of the textbook, the studies mainly focused on building a textbook evaluation checklist (Miekley, 2005) or evaluating the textbook with a teacher questionnaire designed with a Likert scale (Tok, 2010). Quantitative analysis of the textbook mainly focused on finding out the frequency and space in a textbook by analyzing large sets of texts (Pingel, 2010). There have been numerous studies available that applied a qualitative analysis for textbook evaluation. Textbook dialogues were evaluated through conversation analysis (Nguyen & Ishitobi, 2012), and in some cases, textbooks were evaluated by conducting discourse analysis (Gilmore, 2004). Qualitative content analysis has also been applied to evaluate textbooks (Alshumaimeri & Alzyadi, 2015). Besides qualitative and quantitative evaluation methods, some studies applied a mixed-method analysis (Litz, 2005), using a questionnaire containing both closed and open-ended questions. The closed questions were analyzed quantitatively, while open-ended questions were analyzed qualitatively. Though these checklists and questionnaires provide some insights, they have little influence on textbook evaluation and educational decision-making (Hutchinson & Waters, 1987).

2.6.2 Corpus-Based Textbook Analysis

2.6.2.1 Corpora, Textbook, and Real-Life Language

In addition to general textbook analyses and evaluation methods, corpus linguistics has shed light on informing the material developers and teachers to use authentic real-world language in the classroom. “Real-world” or authentic language is the language that is present in a social context, or in other words, language that is used outside the classroom (Dar, 2012). A mismatch between real-life language use and language textbooks is still prevalent though more linguistic structures are being included in modern textbooks. Using authentic classroom materials often facilitates and enhances individual and classroom language learning, and students are more engaged in classroom interactions when authentic materials are used (Dar, 2012; Wen-Cheng et al., 2011). Most importantly, authentic classroom materials help facilitate motivation among learners, and it gives the learners exposure to the real world. Moreover, individual learner needs are better addressed with the use of authentic materials that provide cultural information (Dar, 2012), and it enhances a deeper understanding of any given topic (Wen-Cheng et al., 2011). Authentic classroom materials support the students and help the teachers be more creative (Dar, 2012). As the use of authentic language is considered very important, it is presented in questionnaires as an essential criterion for determining the effective use of language textbooks (Grant, 1987). However, real-life interaction and textbook content are often not similar (Price, 1988). The analysis of textbooks using corpus tools has taken different individual linguistics forms, such as grammar (Biber & Reppen, 2002; Šegedin, 2008), multiword constructions (Hsu, 2014a; Wood & Appel, 2014), idioms (Forssten et al., 2017), metaphor (Alavi & Rajabpoor, 2014), and vocabulary (Hsu, 2013; Mohamad & Puteh, 2017).

2.6.2.2 Corpora, Textbook, and Grammar

Corpus linguistics can help to analyze grammatical features of a textbook, suggest what should be included and how to order grammatical topics in a textbook, and suggest essential vocabulary to illustrate the grammatical items such as tense, verbs, and indirect reported speech, according to real-life use (Biber & Reppen, 2002; Romer, 2005; Šegedin, 2008). Overall grammar analysis of textbooks can be done by compiling lower to advanced grammar textbooks and then comparing the textbook corpus with an established massive corpus like Longman Grammar of Spoken and Written English (LGSWE) that covers multiple registers (conversation, fiction, newspaper language, and academic prose) (Biber & Reppen, 2002). This type of study informs about the contents to be included, their sequence, and the vocabulary required to support the grammar items. Besides the overall analysis of grammar textbooks, specific grammar items like indirect reporting verbs can also be analyzed through corpus-based studies (Šegedin, 2008). Sub-corpora such as a corpus of newspaper articles or TV-series scripts can be used to collect specific grammar items. For single item analysis, software like Antconc 3.2.1 can be useful. Either for overall or specific grammatical items, the result in each case shows that the textbooks are often based on the author's intuitions, not based on empirical research (Biber & Reppen, 2002; Šegedin, 2008),

2.6.2.3 Corpora, Textbooks, and Multiword Constructions

Formulaic language, also known as multiword constructions (MWCs), or lexical bundles (LBs), is the combinations of words identified by the corpus analysis software. They connect lexis and grammar and cover a considerable portion of spoken discourse (Wood, 2009). MWCs can be analyzed using single or multiple corpus tools, and these

types of studies might suggest which MWCs should be selected as a pedagogical outcome in a textbook (Biber, 2006; Hsu, 2014a; Wood & Appel, 2014). As the research on formulaic language or multiword constructions is relatively newer than research on vocabulary and grammar, compiling lists of frequently used MWCs is the primary focus of each study. For the compilation of the MWCs, corpus tools like Wordsmith (Wood & Appel, 2014) and the Range program (Hsu, 2014a) for vocabulary analysis can be used. Some previous research has only focused on providing a list of frequently used MWCs for textbooks, while some other works compared the corpus-based MWC list to a textbook corpus and made an inference through this comparative analysis. Although a corpus-based list of authentic MWCs can bridge the gap between textbooks and real-life (Hsu, 2014a).

2.6.2.4 Corpora, Textbooks, and Idioms and Metaphors

Though idioms are considered to be one type of MWCs, separate corpus-based studies have been done on this issue using textbooks ranging from elementary to advanced level (Alavi & Rajabpoor, 2014; Forssten, et al., 2017; Parizoska & Rajh, 2017). For the analysis of idioms, established large reference corpora like British National Corpus (BNC), Brown corpus, and Michigan Corpus of Academic Spoken English (MICASE) are often used where some of the studies categorized frequently used idioms based on the degree of analyzability and degree of difficulty (Forssten et al., 2017). However, other studies conducted a chi-square test to find the significant difference between the frequency of lexical items in a textbook corpus as compared to that in a reference corpora (Alavi & Rajabpoor, 2014). Irrespective of their method of analysis, corpus-based studies yielded similar results where each of them reported that authors of the textbooks seemed to disregard frequently used idioms, and that the degree of difficulty of a textbook does not

correspond to the levels, and that the usefulness of idioms did not seem to have been considered. When there is a genre-specific reference corpus available, textbook analysis becomes more accessible and reliable. For example, a study related to metaphors in an English business textbook can use genre-specific corpora such as the Business Periodical and Journal Articles (BPJA) corpus (Sznajder, 2010). Like vocabulary and MWC analysis, the Wordsmith Tools can be used to analyze metaphors from the corpus. This type of study can also analyze issues like metaphor collocational patterns and preferences. Similarly, it has also been proposed that metaphors should be selected based on corpus analysis to help learners become more competent in terms of register-specific metaphor use (Sznajder, 2010).

2.6.2.5 Corpora, textbooks, and vocabulary

Vocabulary coverage in different textbooks has been conducted using corpus linguistics in various studies, and in each case, it was found that the textbooks seem to differ from the authentic use of the language (Mohamad & Puteh, 2017; Hsu, 2013). Analysis of textbook vocabulary can be done in different ways using corpus-based tools. Research can analyze different word lists such as General Service List (GSL), the Academic Word List (AWL), or Nursing Education Word List (NEWL), and can also compare the results of this analysis with vocabulary from genre-specific textbooks (Mohamad & Puteh, 2017). Additionally, studies have compiled and examined ESP textbook corpus and built a six-level word-building process (Hsu, 2013). When the word lists or textbooks are available in the digital version, it is easier to compile the corpus. However, to analyze textbooks published in print, optical character recognition (OCR) software becomes very handy for scanning and converting texts into digitalized TXT files

(Hsu, 2013). Various statistical programs can then be used to analyze vocabulary in different contexts, though not all the analysis tools are free to use. Free programs such as Wordsmith Tools 4.0 and Range are popular in evaluating textbooks' vocabulary (Davies & Face, 2006; Hsu, 2013; Mohamad & Puteh, 2017). Moreover, when there is a need to build word-levels for a textbook and compare its difficulty level or frequency, a large dependable, and accessible reference corpus is essential to provide assistance. The BNC is a widely used reference corpus that provides a massive set of word lists (Hsu, 2013). Though there are differences in analysis approaches, there is a consensus that existing textbooks ignore real-life authentic language.

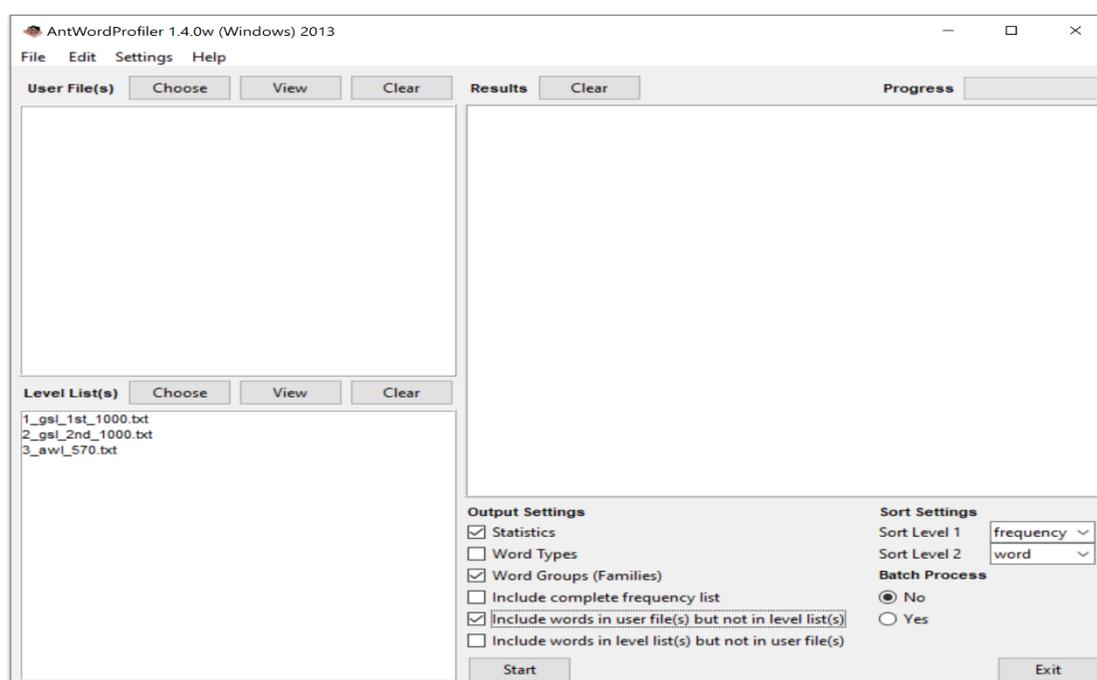
Reference corpora have often been used to represent a language, and coverage studies have allowed us to estimate the number of words that are used in X percent of the language. In the same way, it is also possible to do these kinds of studies using textbooks. In particular, using all of the words from one textbook, we can calculate the percentage that these words make up of the next level of textbook. For example, it would be beneficial to know if primary/elementary textbooks' vocabulary prepares students to use secondary textbooks, and whether the vocabulary found in the early secondary-school textbooks adequately prepare students to read higher secondary textbooks. Furthermore, in terms of vocabulary, it is critical to examine whether the lexical input provided by the k-12 system materials might have prepared students to attend post-secondary education. This thesis tries examines these questions in an EFL context, more specifically, Bangladesh,

2.6.2.6 Vocabulary Processing Programs

In addition to corpus tools such as Wordsmith Tools 4.0 (Scott, 2004) and Range (Heatley et al., 2002), corpus-based vocabulary coverage studies have also used corpus tools such as Lextutor (Cobb, 2002) and Antwordprofiler (Anthony, 2014), as shown in Figure 1.

Figure 1

The user interface of Antwordprofiler



Lextutor has been applied in multiple studies to analyze textbooks (Nguyen, 2020), and teachers and students can easily access Lextutor online to estimate the text difficulty of a given text. Several essential word-lists are also available for use in these analyses in Lextutor, such as the Academic Word List, General Service List, British National Corpus (BNC), and Contemporary American Corpus (COCA). It is an effective tool for generating an overview of any texts' vocabulary. In comparison to Lextutor, Antwordprofiler

(Anthony, 2004) is more suitable in processing texts in batches, like the Range program. Antwordprofiler and Range also provide a great deal of diagnostic output (Kyle, 2020), and they both can help select appropriate vocabulary for meaning-focused input (Webb & Nation, 2008). However, Antwordprofiler is a more advanced program with extra features as compared to the Range program.

One of the key advantages of Antwordprofiler over Range is that Antwordprofiler can operate in multiple operating systems (e.g., Windows, Mac, Linux). In contrast, Range can only operate in Windows. Apart from the AWL and GSL lists, like Range, Antwordprofiler provides access to numerous other wordlists to users. In the output, users can also see which words are not present in the target files than the level lists. Antwordprofiler can highlight the words in a given text with colors according to the words' level, and users can quickly compare texts using provided bar chart by Antwordprofiler (Anthony, 2020). Additionally, by using Antconc (Anthony, 2018), customized level lists can be made, and then they can be compared with target files in Antwordprofiler. One of the vital issues that arises during vocabulary analysis is the operationalization of what a word is because what constitutes a word can be interpreted in a variety of ways, which influences a study's results.

2.7 The Definition of “word”

Word families have been used as a popular unit of lexical proficiency measurement for a long time; many vocabulary tests (e.g., Vocabulary Levels Test, Vocabulary Size Test, etc.) use word families as the counting unit. Word families consist of a headword and its inflectional and derivational forms. On average, a word family has four to six members (Nation, 2006). However, some have more members within one family. For example, the

word “concept” has a family of words, including “conception, concepts, conceptual, conceptualization, conceptualize, conceptualized, conceptualizes, conceptualizing, and conceptually.”

Measuring lexical knowledge with word families means that if an individual knows the word “concept,” the assumption is that they will also know all the other words of the word family. More recently, some research has begun to question the notion of using the word family as a unit of calculation in research as EFL learners may not connect the base words' form and meanings to those of their derivative forms (Kremmel & Schmitt, 2016; Schmitt & Zimmerman, 2002). Schmitt and Zimmerman found that EFL learners could produce less than 20% of the tested word family members. A similar conclusion was drawn by Ward and Chuenjundaeng (2009), who found that for the non-Latinate first language EFL learners with lower-level proficiency, knowledge of one word in a word family might not be representative of the whole family. Additionally, Silva and Clahsen (2008) provided evidence that morphological decomposition does not relate as strongly to L2 processing as it does with L1 processing. They also concluded that second language learners' mental lexicons are not strongly tied with word families. Word families might not be a suitable calculator at all times since different properties characterize the usage and collocations of each word.

However, the massive number of English words cannot be taught or learned individually. Instead, words need to be combined in a realistic and learnable way, which could be through using one word of a family to represent all the words within that family. What makes word families challenging is the derivatives of these words since derivational morphemes make “complete new words,” or they can “make words of a different

grammatical category from the stem” (Yule, 2010, p. 69). On the other hand, inflectional morphemes are not used to produce new words; instead, they indicate aspects of a word's grammatical function. Inflectional morphemes do not change the grammatical category, while derivational morphemes do. Yule provided examples of both inflectional and derivational categories with “old-older” and “teach-teacher” word pairs (p. 70). The inflectional “-er” with the word “old” only creates a different version of the adjective, while the derivational “-er” in “teacher” changes the part of speech. He wrote, “Just because they look the same (-er) does not mean they do the same kind of work” (p. 70). Furthermore, processing derivations of the word families at a large number would demand higher morphological skills for a language learner (Gardner & Davies, 2014).

For the above reasons, limiting the definition of a word to just inflectional morphemes seems more reasonable for second language learners. Research indicates that lemma or flemma could be the most appropriate unit for L2 vocabulary learning (Brown et al., 2020; Kremmel, 2016). Lemmas consist of a headword and their inflected forms along with the irregular forms and reduced forms based on the same part of speech (Francis and Kucera 1982), while flemmas also add identical forms of different parts of speech (McLean, 2018; Pinchbeck, 2017). In between lemma and flemma, lemmas take the parts of speech of a word into consideration, whereas flemmas include all inflections of a base word regardless of the part of speech. For example, the noun *pause* and its plural form *pauses* are the two inflection for the lemma *pause*, whereas the flemma *pause* includes the nominal *pause* and *pauses* along with the verbs *pause*, *pauses*, *paused*, and *pausing* (Stoeckel et al., 2020). It could be more reasonable to say that the knowledge of a lemma or flemma could represent all the other lemma or flemma group members. Dividing

inflections based on parts of speech might increase the learning burden unnecessarily, and identifying lemma requires the texts first to be tagged for part of speech, which means that analyses are more time-consuming and that they would be limited to only certain types of digital texts. The over-generalization of *words* in word-families and the unnecessary learning burden of lemmas made both counting units questionable for beginner-level EFL learners. Therefore, since the most appropriate counting units should be based on an estimation of the learners' abilities (Brown et al., 2020; Kremmel, 2016), the flemma is the counting unit used in this study for Bangladeshi EFL learners as it is a hybrid of the word family and lemma (Pinchbeck, 2017).

2.8 Transition in Academic Stages

A transition is one of the most challenging phases in children's academic life (Zeedyk et al., 2003), and a discontinuity in curriculum and pedagogy has broad impacts on learners' success and motivation (Courtney, 2017). A clear transition plan can make students enjoy the senior levels and encourage them to do more advanced work (Rudduck & Flutter, 2004). Language teaching and learning in an academic context goes through different stages (e.g., primary to secondary, secondary to tertiary), and the transition from one stage to another is not always a smooth one (Graham et al., 2016; Hunt et al., 2008). The primary-secondary transition may affect students in the short-term or long-term, but it is a neglected topic (Topping, 2011). Courtney recognized that the transition from primary to secondary education is a recurring challenge in the UK, especially in foreign language learning. Besides, primary to secondary transition is a problem in the UK, but it also prevails in other countries, and barriers come in different shapes like motivation, bullying, adaptability, and language (Anderson et al., 2000; Pieterinen, 2000). An effective

transition in the early language learning stages is a prerequisite for the ultimate success in teaching and learning (Blondin et al., 1998).

Similar to primary-secondary transition, students' transition to higher education (e.g., college or university) is challenging (Duff, 2001). Crossman (2018) suggested that the primary and secondary (K-12) education system in Alberta might not provide sufficient exposure to the kind of academic language that students would face in university. The transition becomes even harder for language minority (LM) students whose first language is not English and experiencing English as a medium of instruction (Suh, 2016). Students with more robust English language knowledge (i.e., monolingual English speakers) seem to transfer their linguistic skills more easily than second-language English learners (Wagner & Huang, 2011). As the linguistic demand of tertiary education is high (Morris & Cobb, 2014), it is crucial to make the transition a smoother one from secondary to tertiary education. The transition from one level to another can be described taking Krashen's (1989) input hypothesis, one of his five hypotheses, where he emphasized the necessity of comprehensible input. Krashen coined the term "i+1" as comprehensible input, where "i" is the learner's present stage. To put it simply, Krashen (1989) urged that the input at any level should be just beyond the learners' reach (+1), neither very hard nor easy. In a classroom setting, the new "i+1" level could be attained by keeping Vygotsky's (1978) ZPD, where he claimed that actual development could be achieved through "adult guidance or in collaboration with more capable peers" (p. 86).

In Bangladesh, the public school system uses Bengali as a medium of instruction, and the textbooks are also written in Bengali except for the English textbooks. However, in universities, the medium of instruction is sometimes entirely in English or is a combination

of Bengali and English. Most importantly, most of the higher education textbooks in Bangladesh are English and written by native English speakers. In addition to the general challenge of transition to higher education, students with an L2 background face additional challenges during their transition to the university (Sue, 2016; Wagner & Huang, 2011). As academic English is no one's first language (Culp, 1999), it is hard for all students to cope with university education but being an L2 learner with a different medium of instruction is even more challenging. The linguistic demand in universities is high, and students need to face this challenge employing strong lexical knowledge. Therefore, the K-12 curriculum's textbooks should support the students' needs and prepare them for university education. To ensure "i+1" in an EFL context like Bangladesh means to ensure "i+1" in the textbooks since textbooks are the only mode of exposure to the English language in Bangladesh.

To help ease these transitions, a realistic amount of vocabulary needs to be established for each level of the academic stages since students are not only learning vocabulary in their academic curriculum, but they also need to learn the contents of other subjects. They have limited classroom instruction hours in an academic hour, and for that, how many words people can learn in an hour and a year need to be known to the textbook designers and developers.

2.9 Vocabulary Gain/Growth

It is unrealistic to expect that the L2 speakers will gain the same number of words in a year as the first language speaker, and little research has been done to analyze the language growth of L2 learners. Since learning vocabulary depends on factors such as the quality and quantity of input, time, the learning environment, and activities, vocabulary growth might differ considerably from one context to another (Webb & Chang, 2012).

There are a few short-term and long-term studies available regarding lexical growth. Webb and Chang conducted a longitudinal study, which is rare in vocabulary research, in which they measured the vocabulary knowledge of 162 Taiwanese high-school and university EFL learners over five years. They used a bilingual version of the Vocabulary Level Test (VLT). They found a range in vocabulary growth from 18-word families for one group and 430-word families for another. They concluded that a 400-word family per year could be achievable in a language program. They also urged to put greater emphasis on learning vocabulary.

Other word-family based studies reported a range of vocabulary growth. In university-level EFL contexts, after six years of English language instruction, the most frequent 1000–2000 word families were learned by the learners (Nurweni & Read, 1999; Quinn, 1968). Danelund (2013) found that only 48% of the Danish Grade 13 students learned the most frequent 2000-word families after nine years of English language instruction. Cobb and Horst (2001) found that 140-180 words were learned in two months, one hour of instruction each week, of concordance-based learning. Additionally, lemma-based studies have examined the vocabulary growth of EFL students. Milton (2006a) measured Greek private-school EFL learners' vocabulary growth and found a lexical growth of 500 lemmas in a year on average. Some of the students went past 1000 lemmas while some of them failed to learn 400 lemmas per year. Milton (2006b) also examined vocabulary growth in a French as a Foreign Language (FFL) secondary education context in Britain and found the growth of up to 500 lemmas per year. Moreover, Orosz (2009) conducted a study in a primary EFL context in Hungary and concluded that students had an average growth of vocabulary (per year, around 300 to 400 lemmas) where the range was

from 280 lemmas (Grade 6) to 481 lemmas (Grade 5) (see Table 1). Orosz (2009) also estimated the highest hourly mean vocabulary gain of 6.27 lemmas (Grade 3 and Grade 4) and the lowest of 3.36 lemmas (Grade 6).

Table 1

Vocabulary gain in Hungary and Greece (Orosz, 2009)

	Grade 3	Grade 4	Grade 5	Grade 6
Mean vocabulary size estimate Hungary	348	696	1177	1457
Mean vocabulary size estimate Greece	628	1141	1558	2279
Mean vocabulary gain per contact Hungary	6.27	6.27	5.77	3.36
Mean vocabulary gain per contact Greece	6.28	5.13	4.17	7.21

The mean vocabulary gain per hour in Milton's (2006a) study was slightly better in Grade 6 (7.21 lemmas) while the lowest was in 5th grade (4.17 lemmas) (see Table 2). Moreover, Milton (2009) compiled vocabulary gains in different EFL contexts across the world.

Table 2*Vocabulary uptake per hour in different contexts (Milton, 2009)*

Learners	Foreign language	Vocabulary uptake per hour	Source
Hungarian	English	5.4	Milton (2009)
Greek	English	4.7	Milton (2009)
Greek	English	4.4	Milton and Meara (1998)
German	English	4	Milton and Meara (1998)
UK	French	3.8-4.3	Milton and Meara (1998)
Greek	English	2.8	Vassiliu (1994)
UK	French	2.4	Milton (2009)
India	English	1.7-3.3	Barnard (1961)
Indonesia	English	1.7-3.3	Quinn (1968)

The knowledge of vocabulary gain per hour or year of the students in EFL contexts can inform educators and textbook writers to focus on a realistic and achievable input of vocabulary in the EFL textbooks. Among the EFL contexts, Bangladesh has a long history of English language education with locally produced English textbooks.

2.10 Education in Bangladesh

2.10.1 A History of Education in Bangladesh

During their nearly 200 years (1757-1947) rule of the Indian sub-continent, of which present Bangladesh was a part, the British created a class distinction by providing education only to upper-class aristocrats (Rahman et al., 2010). The British were adamant about establishing the western culture and learning through the medium of English. At the end of British rule, Bangladesh (then East Pakistan) became a part of Pakistan (then West Pakistan), which imposed Urdu as the state language and the medium of instruction. Though Bangla was recognized as one of the state languages in 1956, education was

limited to West Pakistan (present-day Pakistan) as a “legacy of colonial education” (p. 119). In independent Bangladesh, the first education policy reform happened through the Qudrat-e-Khuda Commission report of 1974. However, this reform was lost during two successive military regimes (1975-1990) when education was used as a medium to elevate “Bangladeshi” nationalism (Rahman et al., 2010). National education policy-2010 was built consulting two popular reports: the previously mentioned Qudrat-e-Khuda Commission report of 1974 and the Shamsul Huq Education Commission Report of 1997 (Ministry of Education, 2010). The new education policy or the new curriculum mainly focuses on “creativity” through communicative language teaching (Ministry of Education, 2010).

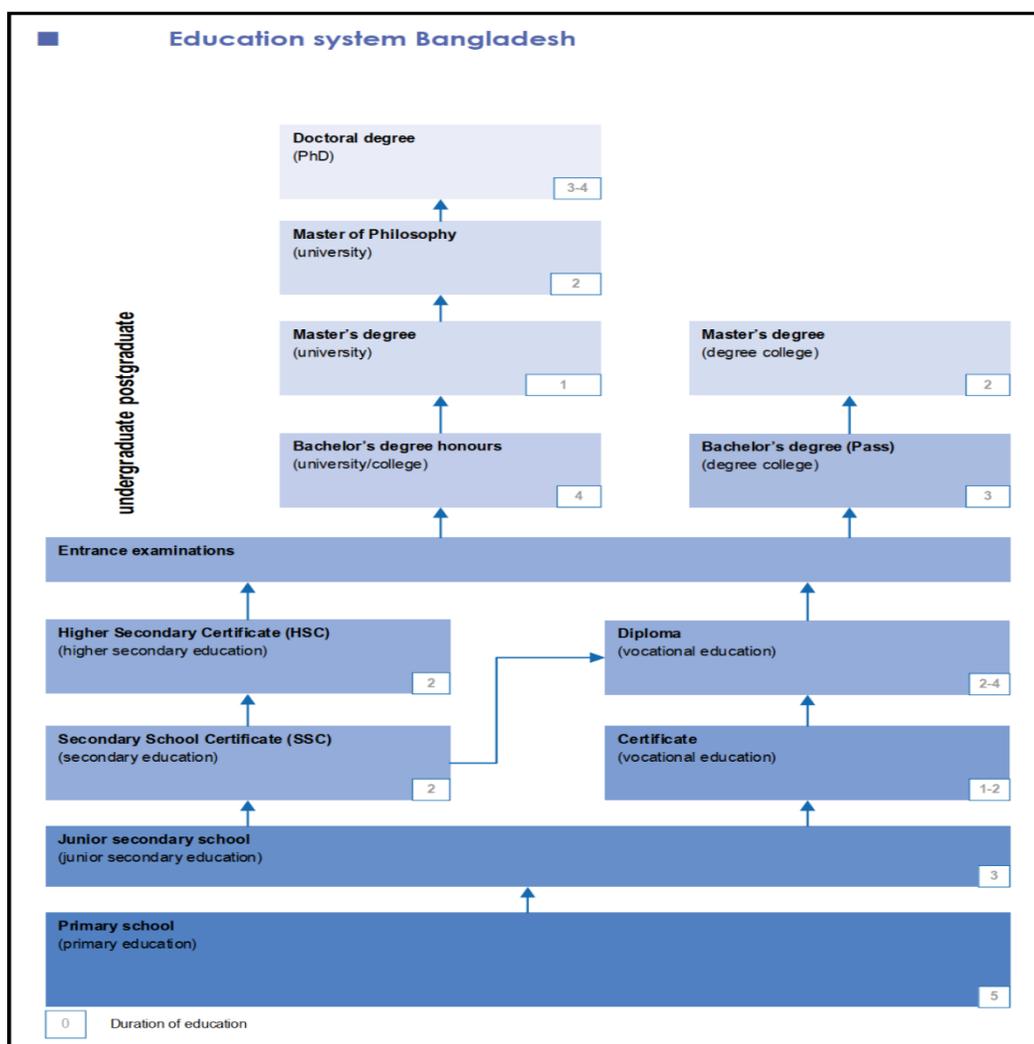
In Bangladesh, Education is dominantly exam-oriented and based mainly on assessing knowledge or recalling “facts and information” (International Bureau of Education, 2007, p. 17). There is little consistency among learning outcomes, course objectives, and public examinations. Additionally, there was almost no attention given to creative thinking or reasoning. Moreover, students were primarily interested in obtaining better grades to secure a place in the job market where education qualification is highly valued (International Bureau of Education, 2007). The primary language of instruction medium of instruction remains Bengali. In the new curriculum, priority on learners’ inner faculties, intellectuality, practicality, and creativity are emphasized in contrast to the education policy of 1974, where building a skilled workforce was mainly emphasized in a post-war situation. However, the extent of creativity this new curriculum results in is yet to be answered.

2.10.2 Education Structure

In Bangladesh, the education system is mainly divided into five levels: primary (Grade 1-5), junior secondary (Grade 6-8), secondary (Grade 9-10), higher secondary (Grade 11-12), and tertiary (university/college education). However, the government recently has decided to implement a four-level education system: primary (Grade 1-8), secondary (Grade 9-10), higher secondary (Grade 11-12), and tertiary (university/college education) (Ministry of Education, 2010).

Figure 2

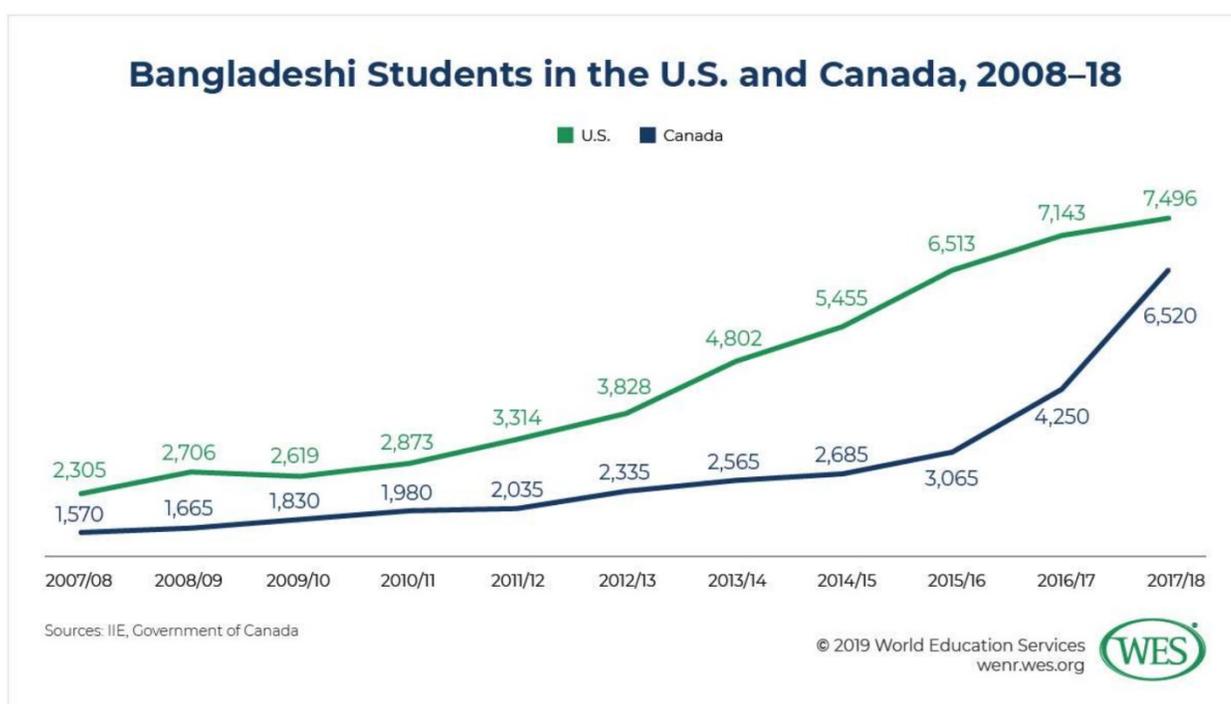
Academic stages in Bangladesh (Bangladesh | Nuffic, 2012)



The change in the education system is still in progress, and like before, there have been public exams after Grade 5, Grade 8, Grade 10, and Grade 12. In tertiary education, there are both public universities and private universities. As students complete Grade 12, most of them compete in public university admission tests. In 2019, nearly one million students passed the Grade 12 public exam (Higher Secondary Certificate exam).

Figure 3

Bangladeshi students studying in the US and Canada (Trines, 2019)



Students who do not attend public universities usually attend other institutions such as the National University or private universities. Moreover, many students go overseas for undergraduate or graduate programs due to low quality of education and lack of employment opportunities in their home country (WES, 2019). According to the UNESCO Institute of Statistics (UIS), the number of Bangladeshi students enrolled overseas has almost been quadrupled (15000-56000) between 2005 and 2017 ("Global Flow of Tertiary-Level Students | UNESCO UIS", 2021). In Canada, 1% of total international students come

from Bangladesh, and from 2017 to 2019, Bangladesh was the fifth country among the fastest-growing (32%) countries of origin in Canada ("International Students in Canada - CBIE," 2021).

English language skills are rewarded in South Asia's market, and it has a vast economic impact since the hourly wage increases by 13% for men if they speak a little bit of English. Moreover, English-speaking people get 34% more hourly wage than non-English speaking people (Azam et al., 2010). English skills not only raise the economic values but also increases the social and cultural capital, boost the economy, and enhance the opportunities for individuals (Erling, 2017).

2.10.3 Textbook Research in Bangladesh

There have been numerous studies that have addressed different aspects of Bangladeshi EFL textbooks to date. As the primary, secondary, and higher secondary education provide a foundation for higher education in Bangladesh, Naznin and Hassan (2016) found three vital issues that help smooth the transition to tertiary education: teaching method, course content, and notably, the quality of English language study at the primary, the secondary and higher secondary level of education. In Bangladesh, textbooks are considered the core source of course content, and they are the primary teaching and learning material nationwide in Bangladesh (Ali, 2017). While investigating the higher secondary English textbook, Ali (2014) found that listening and writing skills are under presented, and the language of the textbook is not authentic. He also concluded that the mismatch between the curriculum and the textbook occurred as the result of teachers and students not being consulted while planning the textbooks; instead, a group of experts prescribed the textbooks for national use. Testing also impacts teaching and learning the

English language in Bangladesh since education is extremely test-oriented (Sultana, 2019). Since the summative public examinations aim only at reading and writing (Sultana, 2018), not speaking or listening, the communicative purpose is absent in the classroom, too, as an effect of washback. Students do not need to communicate, and for that, they do not need to learn the language. In the Secondary School Certificate (SSC) exam after Grade 10, students are given a reading passage from their textbook, and they are required to answer questions (e.g., multiple-choice, fill-in-the-blanks, short answers) from the reading passage. In the grammar section, decontextualized questions are asked based on different grammar items (e.g., tense, parts of speech, the right form of verbs, narration) where almost nothing is communicative (Sultana, 2018). Educators need to develop a plan to make students engage in language learning activities.

Higher education and high-quality education allow the development of English language skills (Erling, 2017). The materials used along the way should prepare students to engage with learning in higher education successfully. Studies that have examined the transition from the Bengali-medium of instruction through Grade 12 to English-medium instruction in universities (Naznin & Hassan, 2016; Rouf, 2012; Siddiqua, 2016) found that the students had difficulty coping with the linguistic demands of university education where the medium of instruction is primarily English. In a private university setting in Bangladesh, Afrin (2016) concluded that lack of vocabulary knowledge and motivation is the root of learners' writing problems, and insufficient vocabulary knowledge of the students is one of the barriers to teach effectively. Jahan and Jahan (2011) conducted a vocabulary-focused study in seven public and two private university contexts where they collected data through questionnaires from 150 students and 30 teachers of three different

faculties: Business and Economics, Humanities and Social Science, and Science and Information Technology. They found that teachers do not do a needs analysis of their learners' vocabulary needs. Thus, vocabulary learning in the classroom becomes very much uninteresting and dissatisfying for the students.

As Mesmer (2008) stated, encountering difficult materials can make students demotivated and lower their self-esteem, it is thus necessary to study if the level of vocabulary makes learning too challenging and difficult. No study has investigated the coverage of textbook vocabulary in the K-12 education system in Bangladesh, and furthermore, no study has yet looked into the possible role of vocabulary plays in the transition to tertiary education from the K-12 system in Bangladesh. Therefore, this study investigates the coverage that K-12 textbooks provide to first-year university textbooks in three different disciplines: English Literature, Commerce, and Engineering. Furthermore, it also calculates how the vocabulary coverage supports different stages of the K-12 curriculum.

Chapter 3: Methodology

This study will address the following research questions:

1. To what extent does Bangladeshi grade-level textbooks' vocabulary prepare students for subsequent stages of K-12 education (e.g., junior, secondary, higher secondary)?
2. To what extent do K-12 Bangladeshi textbooks prepare students for university education in terms of the vocabulary input they provide?

This chapter describes the methods of collecting the materials used for the study and the rationale behind choosing said materials. Next, the process of creating the different sub-corpora for data analysis is provided, and finally, the data analysis procedures are also detailed.

3.1 Materials

3.1.1 Grade-level (K-12) sub-corpora

There are two types of English textbooks from Grade six to Grade nine: one is a Literature textbook with passages for comprehension called English For Today, and another is English Grammar and Composition. The Grammar textbooks (GRA) were treated separately from the four-skills textbook, English for today (EFT), by creating separate sub-corpora and naming conventions. In total, 14 Bangladeshi grade-level English textbooks were used to develop the K-12 corpus. All the textbooks were downloaded from National Curriculum and Textbook Board (NCTB) website. Educational institutions are required to use these books in schools, and the government provides students these textbooks every year for free.

The Grammar and Composition Grade 11-12 textbook was excluded from the study for two reasons. Firstly, the NCTB website, from where the textbooks were downloaded, has not uploaded any copy of a grammar textbook for Grades 11 and 12 (see Appendix-D). Secondly, In Grades 11 and 12, teachers do not use specific grammar textbooks in the classroom. Instead, they give lectures on selected grammar items (e.g., tag questions, narration, verb forms) to prepare students for the Higher Secondary Certificate (HSC) exam (Ahmed, 2013). Students follow lectures and take notes; however, teachers may recommend commercial grammar books that are considered helpful for finding sample exercises similar to those on the HSC exam.

For the convenience of analysis and lexical coverage (which is relevant to the first research question), four sub-corpora of the grade-level textbooks were created. This was to examine how much of a group of textbooks' vocabulary covers a specific grade-level textbook in the data analysis. For example, what percentage does the vocabulary found in the Grade 1-5 textbooks cover the vocabulary used in Grade 6 textbooks? Besides, how much the vocabulary in the Grade 1-7 textbook covers the Grade 8 textbook vocabulary; Similarly, how much the Grade 1-8 textbook vocabulary covers Grade 9 textbook vocabulary; and finally, how much the Grade 1-10 textbook vocabulary covers Grade 11-12 textbook vocabulary. The rationale for selecting these sub-corpora is described below.

3.1.1.1 Why Create a Grade 1-5 Textbook sub-corpus?

Grade 6 is a significant step for Bangladeshi students since students transition from primary to junior high school upon completion of Grade 6. There is some concern of dropout from primary education during and after Grade 5, but passing students are admitted to junior high school. As such, the combined textbooks used in Grades 1-5 were

used to create the sub-corpus encompassing all years of Bangladesh primary education. It should be noted that while primary education previously ended after Grade 5, with Grade 6 being the first year of junior high school, the government of Bangladesh has recently decided to extend primary education to Grade 8.

3.1.1.2 Why Create a Grade 1-7 Textbook Sub-Corpus?

Students in Grade 8 are required to complete a critical public exam in Bangladesh called the Junior School Certificate (JSC). Additionally, as mentioned previously, the government has been planning to extend primary education up to Grade 8 and has implemented this plan in some areas of Bangladesh already.

3.1.1.3 Why Create a Grade 1-8 Textbook Sub-Corpus?

In Grade 9, Bangladeshi high school students specialize in one of the following disciplines: science, humanities, or business studies. This serves as an academic pathway making Grade 9 an important year. Moreover, after Grade 10, students are required to sit an essential public exam called Secondary School Certificate (SSC).

3.1.1.4 Why Create a Grade 1-10 Textbook Sub-Corpus?

After Grade 10, students move to “intermediate college” in Bangladesh for two years (Grade 11-12). After the completion of Grade 12, students in Bangladesh participate in another crucial public exam called the Higher Secondary Certificate (HSC), which plays a vital role in determining whether someone has the chance to study at their desired programs. Students compete to receive admission into bachelor/honors programs where their Grade Point Average (GPA) of both SSC and HSC become an essential determiner of

their success in university or college admission. Some colleges select students for a bachelor's degree based only on those two public examination results.

3.1.2 University Sub-Corpus

The second research question addresses how much the vocabulary in the whole K-12 (Grade 1 to Grade 12) Bangladeshi corpus covers the vocabulary found in first-year university texts. The recommended readings for the first-year, first-semester introductory courses from the twenty-three public universities' English Departments for the Literature sub-corpus were collected from the university websites and verified by asking the first-year English department students and teachers virtually. Three of the Literature textbooks were found to be shared across all the universities. English department textbooks were selected due to the higher demand for studying English at the university level in Bangladesh.

Moreover, the first-year university corpus created by Wood and Appel (2014) was also requested and collected. Wood and Appel commented that Engineering and Commerce programs are two of the most popular programs for international students in a Canadian university. Due to the growing number of Bangladeshi students in Canada in recent years ("International Students in Canada - CBIE," 2021), Wood and Appel's corpus of first-year university textbooks was used. There are a total of ten first-year university textbooks in their corpus, five each for Engineering and Commerce.

From all the thirteen university textbooks, three university sub-corpora were created; English Literature, Engineering, and Commerce (the full list of the textbooks can be seen in Tables 3 and 4).

Table 3*Grade-level textbooks and word count*

Name of Textbook	# of Words
Grade 1- English For Today	2115
Grade 2- English For Today	2391
Grade 3- English For Today	4271
Grade 4- English For Today	8585
Grade 5- English For Today	12064
Grade 6- English For Today	16395
Grade 6- English Grammar and Composition	17719
Grade 7- English For Today	20852
Grade 7- English Grammar and Composition	28669
Grade 8- English For Today	20697
Grade 8- English Grammar and Composition	41254
Grade 9-10- English For Today	40355
Grade 9-10- English Grammar and Composition	55673
Grade 11-12- English For Today	48026
Total	319,066

Table 4*University-level textbooks and word count*

Name of the Textbook	# of Words
Dictionary of Literary Terms and Literary Theory	363,969
A Glossary of Literary Terms	174,150
English Literature	210,629
Engineering Mechanics	66,741
Chemistry	225,805
Problem Solving and Computers	93,672
Physics	244,727
Calculus	173,126
Macroeconomics	167,217
Financial Accounting	147,840
Linear Algebra	100,855
Managerial Accounting	183,791
Business Information and Communication Technologies	174339
Total	2,326,861

3.2 Creating the Corpora

The K-12 textbooks were downloaded from the Bangladesh Education Ministry website in PDF format. As they were image files that did not contain digital text, the pdf files were converted into JPEG files using an online PDF to JPEG converter. The Microsoft Onenote program served as an optical character recognition (OCR) tool (see Table 5 for OCR output). Microsoft Onenote program was used to copy text from the JPEG images, and then the texts were pasted into DOC files.

Once the copying was completed, the copied texts were compared with the original texts. Due to the low resolution of some of the images, the texts needed to be edited and as necessary, texts were rewritten to allow for a full comparison (an example of the OCR output and the cleaned text is shown in Table 5)

Table 5

Example of an OCR output and the cleaned version of the text

OCR output	Cleaned text
I—on 16 An old people's home Ane leeon 7ÄidnB be •ble to • read • write paravaphs A Read the beh" Mariam is a smdent of clus six in a gov«nment school in Rajshahi» Ha ill—gig mother works in an office and ha frther is Hasinewman. Mariam is very fond of ha aunt, her fathers sister, Begum who lives in another part of the same town. On Fridays she goes to h" aunts place and spends ti.nE with	Lesson 16 An old people's home After completing the lesson students will be able to read and understand text ask and answer question write short paragraphs A Read the text below. Mariam is a student of class six in a government school in Rajshahi. Her mother works in an office and her father is a businessman. Mariam is very fond of her aunt, her father's sister, Suraiya Begum, who lives in another part of the same town. On Fridays she often goes to her aunt's place and spends time with her.

After editing each textbook, the '^#' command in the *replace* option of the DOC files was used to remove the numbers. Proper nouns, some common nouns, including nationalities, and abbreviations were excluded manually following the methods of Chujo (2004) since the comparable corpus, or word lists do not typically contain them. This study focuses on content words, and assuming that the students know the proper nouns and abbreviations, deleting them did not affect the analysis results.

Finally, All the DOC files were converted into TXT files. For university-level textbooks, the process was more straightforward, as these files contained digitized text. The textbooks were downloaded online, the number characters were deleted, and the DOC files were finally converted to TXT files. After converting the text files, Corpus Text Processor software was used to standardize the corpus characters. Before standardization, the files were first converted to UTF-8 format using the software. After standardizing the characters in the file, a search was done to identify any non-standard characters. Using the Notepad++ *search* option, the files were searched using the regular expression pattern string `[^\r \t a-z 0-9, \. | - | * | (|) : | + ; @ ' " \ | ? ! $ % _ & # = ~ \ [\] | | \ { \ } | | | ^]`. This search pattern found any characters that were not found on a standard English keyboard. No unusual (i.e., corrupted or non-English) characters were found in the files, and they were, therefore, determined to be ready for the next stage of the analysis.

3.3 Analysis Procedure

3.3.1 Flemma List

In order to operationalize the definition of ‘word’ in this study, a flemma list containing all the word forms occurring in all the created sub-corpora was used. A flemma

list is a text file that organizes head words and their inflections together on one line, and this allows the software AntConc (Anthony, 2018) to count a base word and all of its inflections as the same word when it generates a word frequency list from an input corpus.

3.3.2 Word List generation using AntConc software

In AntConc, the flemma list (provided by Dr. Geoffrey Pinchbeck) was added to the "word list" area that can be found inside the "Tool Preferences" option. After the flemma file was loaded, the grade-level sub-corpora were added individually, and then word lists for each of them were generated. These word lists provide counts of how many times a particular word and its other inflected forms appear in each sub-corpus.

3.3.3 Database organization in MS-Excel

The output data from AntConc was then imported into Excel files so that the headwords were listed in the left-most column, and all the other members of the flemma group, separated by space characters, were listed in the second column. Then, an Excel VLOOKUP function was conducted separately for each word list for each of the textbooks. This allowed all of the word frequency data from all of the textbooks, which were all in separate spreadsheet lists, to be listed within a single Excel spreadsheet. This would then enable the vocabulary frequencies in one sub-corpus to be compared directly to those in any other sub-corpus.

3.3.4 Data Organizing According to the Number of Occurrences

After organizing all the word (i.e., flemma) frequencies of all the words in all textbooks in a single Excel spreadsheet, a new column was created so that the words could be categorized according to a certain minimum threshold of the number of times a word

was found in a corpus. In other words, by assigning certain thresholds of the number of times students would be exposed to words, it would be possible to then make a range of assumptions about whether a student might have 'learned' that word. For example, if the very optimistic assumption is made that a student will have learned all words in a textbook after only a single exposure to any word, then we can use all the words found in that textbook in subsequent coverage studies of the next-level textbook. By increasing the threshold to increasing the number of minimum exposures, it is possible to make less optimistic and more conservative assumptions about whether students will have learned those words before they then progress to the next textbooks at the next educational level. For these studies, four separate studies that made four increasingly less-optimistic assumptions were done about how many word exposures would lead to learning. To sum up, words that occurred a minimum of one, two, three, or four times were used in four separate coverage studies of the next level of textbook materials. Words whose frequencies were below the minimum threshold for each study were not used in that particular coverage study.

The decision to limit the range of one to four word encounters as the threshold for each coverage study in this thesis was based on previous studies which found that vocabulary learning can increase after only two to three repetitions. However, as mentioned previously, other studies have indicated that at least three to five repetitions might be required to enhance vocabulary retrieval speed (Pellicer-Sanchez, 2016; Vidal, 2011). Moreover, other studies have proposed that eight to twelve encounters might be necessary for learning a new word (Horst et al., 1998; Pellicer-Sanchez & Schmitt, 2010). Thus, using 1-4 encounters as a minimum threshold for learning is indeed an optimistic

assumption. This way, if the coverage studies indicate that lower-level textbooks provide insufficient vocabulary input in preparation for higher-level textbooks, we can be assured that this conclusion will have been based on the most optimistic assumptions of student learning.

Words were categorized as 'assumed learned' using the following procedure in Excel. The total number of occurrences of a particular word (i.e., lemma) was found in a textbook, and a formula was written in a new column that would assign a number based on whether it met one of the four minimum assumption thresholds. First, if a word was found a minimum of four times, then a '4' would be assigned to its cell in that column; if it was found three times, then a 3 would be assigned. This procedure was similarly done for the next two columns for words that were present two times ('2') or only once ('1'). The formula also indicated that if a word on the master list was not found in a given corpus, then 0 was assigned.

Then, the words in each sub-corpus (Primary school, Junior-high, Senior-high, University) that met each threshold when all of the books in each sub-corpus were combined were identified. For example, the total number of occurrences of the word "the" in the Grade 1-5 sub-corpus were added together by summing (the SUM function in Excel) the values across all cells that represented each textbook used in Grades 1 through 5. Then, an IF function that defined the conditions by which a word would be marked as having passed the minimum threshold or not was also used. For example, the word "the", as one of the most frequent words in the corpus (1950 times), easily met the minimum threshold in each of the four threshold categories: one, two, three, and four occurrences. However, as the word "arm" appeared only two times in the Grade 1-5 sub-corpus, it met

the threshold for the 1 time and 2-time column but not for the 3 and 4 columns. An example of the combined "SUM" and "IF" formula would look like this:

```
=IF(SUM(O2:S2)>3,4,IF(SUM(O2:S2)>2,3,IF(SUM(O2:S2)>1,2,IF(SUM(O2:S2)>0,1,0))
))
```

3.3.5 Wordlist According to the 1-4 Frequency

After categorizing all the words according to whether they met the 0-4 occurrences thresholds, these Excel filters in this column were used to isolate the flemma forms that we could assume would be known by students using each of the thresholds of occurrence. These flemmas could be used to create wordlists that would be used in AntwordProfiler (Anthony, 2014) for the coverage studies. To do this, in Excel, the cells that had one-time occurring words were filtered (i.e., cells containing '1'). The "visible cells only" option was used to copy the cells to a text file in order to create wordlists to be used in Antwordprofiler for analysis. This procedure was repeated to make AntWordProfiler wordlists for each of the other threshold of occurrences: 2, 3, and 4. As the threshold minimum word frequency increased, the total number of words on the new word lists decreased. This represented the decrease in the number of words that students would be assumed to have learned in the coverage studies.

After copying, the words were pasted into UTF-8 .txt files in Notepad++ to make the wordlist usable in Antwordprofiler. Antwordprofiler requires input word lists to be in a very specific format. All the headwords in a word family/flemma group must be in the left-most column (i.e. no intervening spaces from the start of the line) and all the other members of that word-group need to be on new lines and indented by a tab. Therefore, the

text copied from the Excel file needs to be modified, as the variant forms are in the same row as the headword in Excel. Two "find and replace" steps in Notepad++ were conducted. First, space characters separating words were replaced with a new line character and a tab character "\n\t". This will put the word group members on separate rows from the headword and indented, where the headword was not indented.

3.3.6 Coverage analysis with Antwordprofiler

In order for the analysis in Antwordprofiler (AWP) to work properly, the level lists for each threshold were imported for each separate analysis. Additionally, the following regex token definition was added in the software settings:

```
[a-zA-Z
ÍÓΒÔÒõÕµρPÚÛÛýÝðÐÊËËÈÌÍÎãÃÁÀÀáíóúñÑÇüéääåçêëèììÀÅÉæÆôöòùÿÖÜøØÉ
0123456789]+
```

Four (4) coverage analyses were conducted, separately using each of the 1-4 frequency lists that were created earlier as 'Level Lists' in AWP. In all analyses, Nation's (2012) lists of proper nouns, interjections, and abbreviations were entered into the coverage count before the level-lists in Antwordprofiler. By doing the coverage analysis in this way, the assumption is that students will know how to process proper nouns, abbreviations, and interjections separately from other lexical forms while reading. Any word forms found in any of the Bangladeshi materials corpora that were not on the master flemma list was inspected by Nation's (2012) supplementary lists (described above) individually. Many of these types were non-words (off-list words) that contained numbers or because the image quality made it impossible to guess the spelling of form.

Furthermore, some of the words ended up in the off-lists since they became fused by the OCR process to make a nonsense word (chief + of => chiefof) during the OCR process. Alternatively, OCR would split words up (e.g., temperature => temp + erature). The number of off-list words is very low in all the textbook corpora. For example, in grade-level textbook sub-corpora, Grade 11-12 sub-corpus has the highest percentage of off-list words (0.49%) (see Table 13). Off-list words (word forms that were not in one of the supplementary lists or the on-list flemma list) were ignored in this study.

Once a given set of 'Level Lists' (i.e., words assumed to be known in a set of textbooks) were loaded, and the token settings were made in AWP, the coverage analyses were performed as follows. In the "User File" in AWP, the corpus files that had been compiled from the next higher level of educational materials were then loaded. For example, in order to analyze the Grade 1-5 sub-corpus' vocabulary coverage of Grade 6 textbook vocabulary with one or more encounter, the following word lists were loaded as "Level Lists": (1) the proper noun list, (2) the interjection list, (3) the abbreviation list, (4) the Grade 1-5 - frequency 'one' list. Then the Grade 6 textbook corpus was loaded as the "User File". The 'Word Groups' and 'Batch Process – NO' settings were chosen, and the output was saved to a new Excel spreadsheet. The output provides the percentage of coverage provided by each of the Level Lists and also the cumulative coverage provided by each list as they are loaded in order. In this way, we identified the extent to which the Grade 1-5 sub-corpus vocabulary covers the Grade 6 materials vocabulary; it also provides a list of the words that have never yet been encountered in the materials of previous educational levels. This output includes the percentage that other lists, including proper nouns and abbreviations, cover in each target corpus.

A calculation of the number of contact (class time) hours in Bangladeshi schools and colleges need to be done in order to compare the data with the results of other EFL contexts (see Table 1 and 2). The number of vacations for educational institutions in Bangladesh has been calculated from the annual vacation list from the Directorate of Secondary and Higher Secondary Education (DSHE) website (https://dshe.portal.gov.bd/site/moedu_office_order/237fc528-2eeb-4e7c-bc0d-e7755ad8c7b9). A total of 173 off-days was found (85 days of occasional vacations, 52 Fridays, and 36 exam days). That leaves 192 open days for classes. Besides, in secondary schools, there are usually six days of class with a maximum of six classes per week, and each class usually is 40 minutes (see an example in Appendix E). Therefore, the total number of class time in a year in primary, junior, and secondary schools is 7680 minutes or 128 hours. This number is different for Grade 11 and 12 since these two grades are considered “college”, and college students do not get full two years of instruction. The total number of opening days for college in Bangladesh is approximately 332 days. Therefore, the total class time is 13280 minutes or 221.3 hours.

Chapter 4: Results

This chapter provides a summary of the results in two parts: (1) K-12 grade-level textbooks' vocabulary coverage and (2) to what extent Bangladeshi K-12 textbook vocabulary covers first-year university textbook vocabulary. The grade-level textbook analysis results are presented in clusters. First, the Grade 1-5 textbook lexical coverage of Grade 6 books, followed by the grade 1-7 textbook lexical coverage of Grade 8 textbooks. Then, the Grade 1-8 textbook lexical coverage of Grade 9-10 textbook vocabulary, and then finally, the Grade 1-9 textbooks' lexical coverage of the Grade 11-12 textbook vocabulary. Following this, the university textbook analysis results are presented in three parts, according to the three tertiary academic disciplines that were chosen for the study: Literature, Commerce, and Engineering. Finally, the coverage of four other supplementary lists of proper nouns, interjections, abbreviations, and OCR-defected words is presented.

4.1 K-12 Textbooks' Coverage

4.1.1 Grade 1-5 Lexical Coverage of Grade 6

The coverage of Grade 6 textbooks by vocabulary found in Grades 1-5 is shown in Table 6. If we consider that the students will recognize any word of Grade 6 textbooks if they have encountered these words in Grades 1 to 5 at least once, the Grade 1-5 sub-corpus covers 88.70% of grade 6 textbooks. That means that learners will not know approximately one word in every nine words of running text. That is, approximately one word will likely be unknown in almost every sentence. If all of the new words that students encounter in the grade six textbook need to be learned by students during the school year during class time, the students will encounter a new word about every 5 minutes, and in a single class

hour, they will need to learn 12 new words to know every new word of the grade 6 textbooks.

This coverage provided by the Grade 1-5 textbook vocabulary decreases as the minimum threshold of repeated word encounters increases. As shown in Table 6, the lexical coverage of the Grade 6 textbook vocabulary provided by words that are encountered two or three times in the grade 1-5 textbooks is 85.98% and 83.73%, respectively. This means that 13.99% or 16.23% of words in the grade 6 textbooks, respectively, are not likely to have been learned incidentally by the students. If the minimum threshold of four encounters for a word was used, there would be a further 6.66% of coverage decrease as compared to when the minimum one-encounter threshold is used (Table 6). When the four encounter threshold is used, there would be a total of 2087 unknown words in the Grade 6 textbook. In this case, an unknown word would be encountered in every 5-6 words, representing 17.92% of the entire corpus for students and teachers to deal with.

Table 6

Grade 1-5 textbooks' vocabulary coverage of Grade-6 Textbook vocabulary

Threshold number of Words Encountered (minimum)	Coverage Token %	New Words (Flemma)	Tokens to be Learned %	Minutes per new word encounter	Words per hour
1	88.70	1597	11.28	5*	12**
2	85.98	1840	13.99	4	14
3	83.73	1988	16.23	3	15
4	82.04	2087	17.92	3	16

Note: * An English class is 40 minutes and a maximum of 6 English classes per week. One hundred ninety-two days of class days per year results in 7680 minutes of class-time. Total minutes/number of new words.
 ** 7680 minutes=128 hours. The number of new words/total hour.

Alternatively, this would mean students would likely face, on average, two unknown words in a sentence of 10-12 words. When this number of words would be considered in terms of available class time, they would need to deal with 16 new words approximately every hour, not counting proper nouns, abbreviations, and interjections.

4.1.2 Grade 1-7 Lexical Coverage of Grade 8

As shown in Table 7, the Grade 1-7 sub-corpus vocabulary covers 96.37% of the Grade 8 textbook corpus vocabulary when it is assumed that a single occurrence of a word is sufficient for learning all words. Additionally, this coverage figure also assumes that students are able to deal with all proper nouns, interjections, and abbreviations.

Table 7

Grade 1-7 textbooks' coverage of Grade-8 Textbooks

Threshold number of Words Encountered (minimum)	Coverage Token %	New Words (Flemma)	Tokens to be Learned %	Minutes per new word encountered	Words per hour
1	96.37	1160	3.62	6*	9**
2	94.82	1605	5.17	5	12
3	93.60	1954	6.38	4	15
4	92.47	2235	7.52	3	17

Note: * An English class is 40 minutes and a maximum of 6 English classes per week. One hundred ninety-two days of class days per year results in 7680 minutes of class-time. Total minutes/number of new words.
 ** 7680 minutes=128 hours. The number of new words/total hour.

When the minimum threshold of four encounters is used, the coverage of the Grade 8 textbooks' vocabulary goes down to 92.47%, leaving 2235 unknown words for the students to deal with. When it is assumed that 4 encounters is required for learning all words, students will encounter, on average, one unknown word in every 13 words. This also means that students will have to learn 17 new words for every hour of class time to obtain 100% lexical coverage. Using the three encounter threshold for the Grade 1-7 textbook vocabulary would leave students to deal with 1954 unknown words in Grade 8

materials. Notably, the coverage percentages for two, three, and four encounters are higher (94.82%, 93.60%, and 92.47%, respectively) than that for the Grade 1-5 sub-corpus's coverage of Grade 6. However, the number of new words that would be encountered is almost double when the 4-encounter threshold is compared to that of the 1 encounter threshold.

4.1.3 Grade 1-8 Lexical Coverage of Grade 9-10

As shown in Table 8, the Grade 1-8 textbooks' lexical coverage of Grade 9 sub-corpus show results that are similar to those shown for the other grade analyses. When only one encounter is assumed enough for knowing the vocabulary found in Grade 1-8 textbooks, including being able to manage all the proper nouns, interjections, and abbreviations, the Grade 1-8 sub-corpus covers 96.96 percent of the Grade 9 sub-corpus.

Table 8

Grade 1-8 textbooks' coverage of Grade 9-10 textbooks vocabulary

Threshold number of Words Encountered (minimum)	Coverage Token %	New Words (Flemma)	Tokens to be Learned %	Minutes per new word encountered	Words per hour
1	96.96	1738	3.03	8*	6**
2	95.59	2388	4.4	6	9
3	94.44	2828	5.54	5	11
4	93.41	3175	6.57	4	12

Note: * An English class is 40 minutes and a maximum of 6 English classes per week. One hundred ninety-two days of class days per year. Grades 9 and 10 have the same English book for two years. 15360 minutes of class-time. Total minutes/number of new words.

** 15360 minutes=256 hours. The number of new words/total hour.

That means students would encounter an unknown word in every 33 words of text, on average. If all of the class time were devoted to dealing with unknown vocabulary in the Grade 9 textbooks, then every hour, students would need to learn six words. This takes into account that the same Grade 9 textbooks are used over two entire school years. When

a less optimistic threshold of a minimum two time encounters is used, there is a significant increase in new words – 650 more new words – compared to when only one encounter is assumed to be enough to know a word. There are 1437 more new words when the four encounter threshold is used (3175 words - 1738 words) as compared to when only one encounter is assumed enough.

4.1.4 Grade 1-10 Lexical Coverage of Grade 11-12

The coverage provided by the Grade 1-10 textbooks' vocabulary for the only available Grade 11-12 textbook is shown in Table 9. Overall, the results of Grade 11-12 analyses differ somewhat from those of other grades as students in these grades in Bangladesh are considered to be in "college" studying under a slightly different schedule. Over these grades, students attend one and a half years of regular class time, and the class schedule varies somewhat from institution to institution. Assuming all words encountered are learned, the Grade 1-10 textbooks cover 95.49% of the vocabulary of the Grade 11-12 textbook sub-corpus, leaving 1330 new words to be dealt with by students and teachers in Grades 11 and 12.

Table 9

Grade 1-10 textbooks' coverage of Grade 11-12 Textbook

Threshold number of Words Encountered (minimum)	Coverage Token %	New Words (Flemma)	Tokens to be Learned %	Minutes per new word encountered	Words per hour
1	95.49	1330	4.49	10*	6**
2	93.65	1808	6.32	7	8
3	92.05	2153	7.91	6	9
4	91.27	2351	8.68	5	10

Note: * Per English class is 40 minutes and a maximum of 6 English classes per week. Three hundred thirty-two days of class days in two years. Grades 11 and 12 have the same English book for two years. 13,280 minutes of class-time. Total minutes/number of new words.

** 13280 minutes=221.3 hour. The number of new words/total hour.

The number of new words that were calculated by these analyses approximately doubles when the minimum threshold of four encounters is used (2351 words vs. 1330 words). Moreover, when the four minimum encounters assumption is made, 8.68% (or one every 11-12 words) of the Grade 11-12 texts would be seen as unknown words, not including all the proper nouns, abbreviations, and/or interjections. This rate of unknown words would require that in per hour of class time, 10 new words should be dealt with somehow by teachers and students if all available class time were devoted.

4.2 University First-Year Textbooks' Coverage

The vocabulary coverage of university textbooks is divided into three parts: one part each for Engineering, Commerce, and Literature textbooks.

4.2.1 Grade 1-12 Textbooks' Coverage of University Engineering Textbooks

The results showing the coverage that all Bangladeshi K-12 textbook vocabulary has in the Engineering corpus and in each of its sub-corpora is shown in Table 10. First, when all words present in the entire Bangladeshi K-12 textbook corpus are assumed known, the words covered 92.6% of the Engineering textbook sub-corpus.

Table 10

Grade 1-12 textbooks' coverage of University Engineering Textbooks

	Engineering overall			Chemistry		Programming		Mechanics		Calculus		Physics	
Encoun- -ters	Cov %	New Words	Cov %	New Words	Cov %	New Words	Cov %	New Words	Cov %	New Words	Cov %	New Words	
1	92.6	3778	94.7	188	94.8	35	92.9	554	93.8	412	96.9	3173	
2	91.0	4400	92.1	251	92.4	50	91.2	734	92.5	536	90.8	3654	
3	89.1	4844	90.5	301	90.0	60	88.5	865	91.8	620	88.8	4028	
4	88.1	5131	88.8	334	89.5	64	87.4	949	91.0	677	87.8	4278	

Note: The bold fonts indicate the coverages close to or above 95%.

Additionally, there were 3778 words in the Engineering corpus that were not found in the K-12 corpus, not including any proper nouns, interjections, and/or abbreviations. When the five Engineering subject textbooks – Chemistry, Physics, Engineering Mechanics, Calculus, and Programming – were examined, the K-12 vocabulary covered a range of words between 92.9% (Mechanics) and 96.9% (Physics) of the textbooks. When the minimum threshold of word encounters is raised above a single encounter, coverage drops to below 90% in all subjects, except for Calculus, where 91% of the vocabulary was covered by the words found 4 or more times in the K-12 corpus. Notably, the Physics textbook's vocabulary coverage decreases by almost ten percent (96.9% to 87.8%) with more than one thousand new word differences as the threshold was raised from one encounter to four. Interestingly, the difference in coverage between a minimum threshold of one and two encounters was large (6.1%), and this was accompanied by an almost five-hundred word increase in unknown words if students are assumed to require at least two encounters to retain the knowledge of K-12 words by the time they reach university. In total, more than five thousand new words need to be somehow dealt with by Bangladeshi university students if the threshold is increased to four encounters in the K-12 materials. On the other hand, Engineering Mechanics and Calculus textbooks' coverage was 92.9 % and 93.8 %, respectively, when only one encounter is enough to learn new vocabulary in Bangladesh's K-12 education system. For the Engineering Mechanics textbook, the number of new words surges to almost one thousand words when the minimum threshold of four encounters is assumed required for learning a word prior to transitioning from K-12 classes.

4.2.2 Grade 1-12 Textbooks' Coverage of University Commerce Textbooks

The results showing the coverage that all K-12 textbook vocabulary has in the Commerce corpus and in each of its subject sub-corpora are shown in Table 11. Commerce textbooks, including Financial Accounting, Linear Algebra, and Managerial Accounting, are covered by 91.9%, 88.2%, and 92.9%, respectively, when a minimum threshold of one encounter in the K-12 materials is used.

Table 11

Grade 1-12 textbooks' coverage of University Commerce Textbooks

Encoun- ters	Commerce overall		Macro- economics		Financial Accounting		Linear Algebra		Managerial Accounting		Globalization	
	Cov %	New Words	Cov %	New Words	Cov %	New Words	Cov %	New Words	Cov %	New Words	Cov %	New Words
1	94.5	6198	94.6	2450	91.9	223	88.2	115	92.9	2183	96.3	2778
2	92.7	7526	92.9	2985	90.5	276	87.1	148	90.9	2765	94.6	3653
3	90.9	8480	91.2	3413	88.0	335	86.3	167	88.6	3200	93.4	4283
4	89.9	9047	90.3	3672	86.6	365	85.5	183	87.4	3440	92.3	4692

Note: The bold fonts indicate the coverages close to or above 95%.

The number of new words that students would encounter in the Financial Accounting and Linear Algebra textbooks is low (223 and 115 respectively), and these numbers do not increase substantially as the encounters thresholds increase. For example, the coverage provided by the K-12 vocabulary of the Linear Algebra textbook with a minimum of four encounters is quite low at 85.5%, which means the students will encounter at least one unknown word in every seven to eight words; however, the total number of new words in this subject's textbook is only 183. On the other hand, the language-rich textbook for Globalization ('The World is Flat') contains 2278 words that are not found in the K-12 corpus and when all of the K-12 vocabulary is assumed to be known, it covers 96.3% of this text. When the minimum threshold of four encounters is

used, the number of unknown words increases to 4692 words, and the K-12 vocabulary only covers 92.3% of the textbook. Additionally, in the Macroeconomics textbook, the coverage is relatively high (94.6%), with a minimum of one required encounter is used, and there are 2450 unknown words. Significantly, this number of words assumed to be unknown increases to almost 4 thousand words when a threshold of four encounters is used, while the coverage percentage decreases to 90.3%. Overall, the K-12 Bangladeshi textbooks' vocabulary covers a higher percentage (94.5) of lexical items in the Commerce textbook corpus as compared to that in the Engineering textbooks (92.6%).

4.2.3 Grade 1-12 Textbooks' Coverage of English Literature Textbooks

The results showing the coverage that all K-12 textbook vocabulary has in the English Literature corpus and in each of its subject sub-corpora is shown in Table 12. Two of the English Literature textbooks that contained descriptions and definitions of the literary terms and theories have lower levels of coverage (91.6% and 91.7%) compared to the textbooks on the history of English Literature (94.6%) when a threshold of one encounter of the K-12 words was used. The Glossary of Literary Terms textbook had 91.6% coverage by the K-12 textbook sub-corpus with a deficiency of 4366 words previously unseen in K-12 materials (considering one encounter threshold). Interestingly, this coverage decreased almost by 3%, when the threshold was increased to two-time encounters. When a minimum of four encounters was used, the coverage dropped to 85.7%, which means that a first-year university student would not likely know one word in every seven words in that book. Similar coverage results were found for the Dictionary of Literary Terms and Literary Theories textbook. However, the number of unknown words is more than double compared to The Glossary of Literary Terms textbook since a threshold

minimum of one encounter in the K-12 sub-corpus would leave 9964 unknown words to be dealt with by learners, and a four encounters threshold would leave students with almost 13 thousand (12716) unknown words.

Table 12

Grade 1-12 textbooks' coverage of English Literature Textbooks

Encounters	Literature overall		History of English literature		Glossary of Literary Terms		Dictionary of Literary Terms	
	Cov %	New Words	Cov %	New Words	Cov %	New Words	Cov %	New Words
1	92.6	12016	94.6	3952	91.6	4366	91.7	9664
2	90.3	14071	92.6	4985	88.7	5295	89.7	11171
3	88.9	15336	91.1	5631	87.1	5924	88.3	12098
4	87.5	16157	89.8	6118	85.7	6331	87.1	12716

Note: The bold fonts indicate the coverages close to or above 95%.

The History of English Literature text was found to be covered to the highest degree (94.6%) among all English Literature textbooks by the K-12 vocabulary when a minimum one encounter threshold was used. However, a threshold of four encounters decreases the coverage percentage to 89.8%, leaving 6118 words to be dealt with by new university students. Overall, the English Literature textbook sub-corpus has coverage of 92.6% when a minimum threshold of one encounter is used, while a minimum threshold of four encounters drops the percentage to 87.5%, leaving students with more than 16,000 unknown words.

4.3 Supplementary Lists' Coverage

The coverage of each of the corpora used in this study by supplementary-list word forms is shown in Table 13. During the data analysis, the proper nouns, interjections, and abbreviations were regarded as known to the students, or alternatively, that students would process these forms separately from other lexical forms. The calculation of the coverage

percentage of all supplementary-list forms was conducted with these supplementary lists. In the K-12 textbook vocabulary analysis, the percentage of words in the supplementary lists was minimal, in part because some of the proper nouns (person and place names) were manually removed from the corpus prior to the coverage studies. For instance, personal names like *Mouli, Ritu, Rony, Tanim*, and place names like *Bangladesh, Dhaka, Magura, India* were excluded. In the grade-level textbooks, the percent coverage provided by any of the supplementary lists did not surpass 1% of the total vocabulary of that sub-corpus. Grade 9-10 textbooks contained the highest number of proper nouns (553 tokens), interjections (456 tokens), and abbreviations (71 tokens) among K-12 target corpora. It should be noted that the number of OCR-defected words (words that went to the off-list mainly due to the problem during the conversion of the textbooks using OCR software) contributed to boosting the total number of non-calculated words.

Table 13

Coverage results of supplementary lists

Target Levels	Proper nouns		Interjections		Abbreviations		OCR-defects/ Off-lists		Total	
	Token	Token %	Token	Token %	Token	Token %	Token	Token %	Token	Token %
Grade-6	188	0.55	147	0.43	32	0.09	69	0.20	436	1.27
Grade-8	407	0.66	275	0.44	63	0.1	107	0.17	852	1.37
Grade 9-10	553	0.58	456	0.47	71	0.07	251	0.26	1331	1.38
Grade 11-12	368	0.77	217	0.45	22	0.05	233	0.49	840	1.76
Engineering	2455	0.7	10328	2.93	2464	0.7	16549	4.69	31796	9.02
Commerce	10365	1.92	2499	0.46	1548	0.29	14524	2.69	28936	5.36
Literature	45008	5.95	11933	1.58	1169	0.15	26104	3.45	84214	11.13

Among the three university disciplines, Engineering textbooks contained a similar proportion of proper nouns as the K-12 corpora. However, the interjection list covers more than 10 thousand (10328) tokens of text with a coverage percentage of 2.93% in the

Engineering corpus. The Commerce textbooks showed the opposite pattern, as the proper nouns represented more than 10 thousand (10365) tokens of text, while the interjection coverage percentage is 0.46. Furthermore, a significant number of abbreviations are found in Engineering (2464 tokens) and Commerce (1548 tokens) textbooks. Interestingly, although the total number of supplementary list words does not differ a great deal between Engineering (31796 tokens) and Commerce (28936 tokens) textbooks, the coverage percentage displayed a difference of 3.66%. Engineering textbooks' total supplementary list coverage (9.02%) is more than that of the Commerce (5.36%) textbooks. For the Literature textbooks, both the coverage percentage and the number of the supplementary lists' words were higher than the two other university sub-corpora. More than 45 thousand proper nouns are present in the Literature textbooks with a coverage of 5.95%, and this also includes almost 12 thousand tokens (11933) of interjections. Overall, the Literature textbooks' supplementary lists cover 11.13% of the corpus with 84214 tokens in that list mainly because of the number of OCR-defected/off-list words.

Chapter 5: Discussion

In this chapter, results and findings are discussed with reference to previous literature. This discussion chapter is primarily focused on addressing the two research questions. Quantitative coverage data is described and compared to other studies in EFL textbook vocabulary acquisition with examples. At the end of the chapter, the study's limitations, recommendations, pedagogical implications, and suggestions for future research are also discussed.

5.1 Research Question 1: To what extent does Bangladeshi grade-level textbooks' vocabulary prepare students for different stages of K-12 (e.g., primary, junior, secondary, and higher secondary)?

5.1.1 Lexical Coverage

Quality early education provides a strong foundation of children's knowledge that assists children in future learning. The first research question aims at addressing the extent to the Bangladeshi textbooks' vocabulary help students to precede through each K-12 stage, and lexical coverage analysis is used as one of the indicators of vocabulary preparedness.

5.1.1.1 Grade 1-5 Textbooks' Lexical Coverage of Grade 6

In Bangladesh, Grade 6 is an important transition point for early education since students participate in a public exam (Primary Education Certificate [PEC]) at the end of Grade 5 in order to qualify for Grade 6. Students used to finish their primary education upon completion of Grade 5 and attend junior high school starting at Grade 6. However, in the National Education Policy (2010), the Bangladeshi government proposed that primary

education continue to Grade 8. The implementation of that policy is still in progress and for that reason, the government is continuing the PEC examination to evaluate students after Grade 5. Despite the importance of this critical stage for Bangladeshi students, the results of the present study present some points of concern regarding the vocabulary gap between the primary textbook materials and those used in Grade 6. Even if the assumption is made that students learn all of the words that occur in the Grade 1- 5 textbooks, these words only cover 88.7% of the Grade 6 textbooks. Although 88.70% coverage might seem like a large number, the minimum threshold that has been suggested for a basic understanding of a text is 98%, and where 95% might be possible, provided that it is done along with the scaffolding and/or assistance of a teacher or supplementary resources (e.g., a dictionary, glossary, and other teacher-led supports). 95% coverage of any text means only 5% (one word in every 20) of the words are unknown, and these could be dealt with through instruction and other forms of learning that require external support. A coverage of 95% is thought to be a manageable level for effective classroom instruction since without 95% coverage, meaning-focused instruction would become difficult. In the case of the Bangladeshi Grade 6 texts, however, 12% of unknown words in a text indicates the students of that class would likely not know one word in every eight to nine words.

Figure 4 provides an example of a Grade 6 text where words that are not present in the Grade 1-5 materials have been obscured. This figure indicates the huge number of unknown words that new Grade 6 Bangladeshi students might face while using a Grade 6 text, even if they know all the words found in all of the Grade 1-5 English textbooks. It is unlikely that the students will guess the meaning from the textual context while sentences contain 3-4 unknown words.

Figure 4

Example of a Grade 6 text containing the new words with four encounter threshold

People around the world are slowly changing their attitude towards medicine. More and more they are turning to natural cures. Natural cures are made of natural things, most often herbs and plants. History says that natural or herbal remedies are nothing new. People used them all along in different ages. Herbal medicines were used in ancient civilizations like India, China, Greece, Egypt, and Rome. Some ancient treatment systems are still in practice today. They have come down through generations.

For a minor burn injury, the doctor may prescribe you a tube of ointment. But for the same, a rural grandma may put some aloe vera or use cold water. If children have cold in our country, grandmas give them honey and tulsi leaves to eat. And it works too. If you have a minor cut or wound, grown-ups may put some turmeric, marigold or aloe vera on it. Rural people usually use garlic, neem or turmeric to cure skin problems. With experience they have seen that these remedies work. Moreover, they are easy to get, are cheap and most often are without any side effects.

The concerns raised above refer to the situation where a hypothetical Grade 6 student is able to recall every word in the Grade 1-5 textbooks, even if they encounter that word only one time. This assumption is likely not realistic and the number of words that students would likely retain from previous course texts is significantly lower than what other scholars' have suggested in terms of the average number of encounters that are required for incidental word learning to take place (Nation & Wang, 1999; Webb, 2007). If the assumption of the study is made less optimistic, and we use Pellicer-Sánchez's (2016) suggested requirement of three to four word encounters, the coverage of the Grade 6 books provided by the Grade 1-5 vocabulary seems quite daunting for students. Using the 4 word requirement, the coverage decreases to 82.04%, which means the students would not know 17.92% of the words of the Grade 6 textbooks. 17.92% unknown words in the textbooks suggest that students do not know one word in every five words. In the case of four

encounters, students who pass Grade 5 and are currently attending Grade 6 will not know 2087 words in Grade 6 English textbooks.

5.1.1.2 Grade 1-7 Textbooks' Lexical Coverage of Grade 8

Grade 8 is a crucial time for Bangladeshi students due to the important public exam (Junior School Certificate) at the end of the year of Grade 8. Moreover, the government's decision to make primary education continue to Grade 8 has also made it an even more important time. Although the Grade 1-7 sub-corpus' lexical coverage of Grade 8 texts is better than the Grade 1-5 sub-corpus' coverage of the Grade 6 texts, the number of new words that Grade 8 students would have to manage is still high. One encounter threshold leaves students with 1160 unknown words despite covering 96.37% of the textbook vocabulary. Notably, the number of unknown words increases by almost eight hundred when the threshold encounter number goes up from one to three. Moreover, the coverage percentage decreases as the number of encounter threshold goes up. Four encounter threshold creates a vocabulary gap of 2235 unknown words. 7.52% unknown words in texts mean students might not know one word in every thirteen words; that means students might face one unknown word on average in every sentence in the Grade-8 textbook.

Figure 5 provides an example of a Grade 8 text where words that are present fewer than 4 times in the Grade 1-7 materials have been obscured. This passage indicates the difficulty that the Grade-8 students might face in terms of vocabulary while reading the text. It would be harder for the students to guess the meaning also since there are unknown words in every sentence.

Figure 5

Example of a Grade 8 text containing the new words with four encounter threshold

Oxygen and the air pressure are always being monitored. In the event of a lack of oxygen, an oxygen mask will automatically appear in front of you. Pull the mask towards you and place it firmly over your nose and mouths. Secure the elastic band behind your head and breathe normally. If you are travelling with a child or someone who requires assistance, secure your mask first, and then assist the other person. Keep your mask on until a uniformed crew member advises you to remove it.

In the event of an emergency, please assume the bracing position. That is, lean forward with your hands-on top of your head and your elbows against your thighs. Ensure your feet are flat on the floor.

A life vest is located in a pouch under your seat or between the armrests. When instructed to do so, open the plastic pouch and remove the vest. Slip it over your head. Pass the straps around your waist and adjust at the front. To inflate the vest, pull firmly on the red cord, before you leave the aircraft. We remind you that this is a non-smoking flight.

You will find this and all the other safety information in the card located in the seat pocket in front of you. We strongly suggest you read it before takeoff. If you have any questions, please don't hesitate to ask one of our crew members. We wish you all an enjoyable flight.

From the above text and the lexical coverage percentage, it is clear that guessing the meaning of the words from the textual contexts might not be easier for the Grade-8 students. For example, the first sentence of the text from Figure 5 has three important words obscured. It might be harder even for a proficient learner to guess the hidden words. Thus, for a Grade 8 Bangladeshi learner, it would be a daunting task to guess the meaning of the words.

5.1.1.3 Grade 1-8 Textbooks Lexical Coverage of Grade 9-10

The starting of secondary school in Grade 9 and one of the most important public exams (Secondary School Certificate) at the end of Grade 10 make Grade 9 and 10 very important for the Bangladeshi students. Grades 9 and 10 use the same EFL textbooks for two academic years: typically, half in Grade 9 and the other half in Grade 10. Moreover, students choose academic disciplines (Science, Humanities, or Business Studies) in Grade 9. Grade 1-8 textbooks' lexical coverage of Grade 9-10 is similar to the Grade 1-7 textbooks' lexical coverage of Grade 8 materials. One encounter threshold results in a coverage of 96.96%, leaving only 3.03% unknown words. However, this represents about 1738 new words for students who are assumed to know all the words of Grade 1-8 English textbooks as well as the proper nouns, abbreviations, and conjunctions. Setting the encounter threshold to four increases the number of unknown words to almost double (3175 words) than that for the one encounter threshold (1738 words). 6.57% of unknown words for four encounter threshold means students would not know one word in 15 words.

Figure 6 provides an example of a Grade 9-10 text where words that are present fewer than 4 times in the Grade 1-8 materials have been obscured. This passage shows that the unknown words are present in every sentence and this text might be difficult to understand for Grade 9-10 students.

Figure 6

Example of a Grade 9-10 text containing the new words with four encounter threshold

Countries of the world rely heavily on **petroleum**, coal and natural gas for their energy sources. There are two major types of energy sources: **renewable** and **nonrenewable**. **Hydrocarbon** or **fossil** fuels are **nonrenewable** sources of energy. **Reliance** on them **poses** real big problems. First, **fossil** fuels such as oil, coal, gas etc, are **finite** energy resources and the world **eventually** will run out of them. Secondly, they will become too expensive in the coming **decades** and too for the environment. Thirdly, **fossil** fuels have direct polluting impacts on earth's environment causing global warming. In **contrast**, **renewable** energy sources such as, wind and **solar** energy are **constantly** and **naturally replenished** and never run out.

Most **renewable** energy comes either **directly** or **indirectly** from the sun, **Sunlight** or **solar** energy can be used for heating and **lighting** homes, for **generating** electricity and for other commercial and **industrial** uses.

The sun's heat drives the wind and this wind energy' can be **captured** with wind **turbines** to produce electricity. Then the wind and the sun's heat cause water to **evaporate**. When the water **vapor** turns into **rain** or snow and flows **downhill** into rivers or streams, its energy can be **captured** as **hydroelectric** energy.

5.1.1.4 Grade 1-10 Textbooks Lexical Coverage of Grade 11-12

Grades 11 and 12 are significant for the Bangladeshi students because this period is the “intermediate college” for the students, and after Grade 12, there is the most important public exam (Higher Secondary Certificate) to sit, which is an important gatekeeper for future higher education. The result of the HSC examination is very much important for university admission.

Grade 1-10 textbooks' lexical coverage of Grade 11-12 textbook is higher compared to Grade 1-5 textbooks' lexical coverage of Grade 6. However, the coverage percentage is similar to Grade 1-7 textbooks' vocabulary coverage percentage of Grade 8

and Grade 1-18 textbooks' vocabulary percentage of Grade 9-10. One of the reasons for this higher coverage percentage may be the result of comparing two types of Grade 1-10 textbooks (1) English For Today and 2) English Grammar and Composition) while only English for Today was included in the Grade 11-12 materials corpus. Notably, the Grade 9-10 sub-corpora (96025 tokens) has almost double the words of that of the Grade 11-12 sub-corpora (48026 tokens). The vocabulary from the Grade 1-10 textbooks covers 95.49% of the Grade 11-12 textbook sub-corpora, leaving students to deal with 1330 words that they have previously never encountered. If we consider four encounters as the minimum threshold required for vocabulary recall, then the coverage of the Grade 11-12 textbook decreases to 91.27%, which, again, is well below the recommended percentage of 95% for assisted learning.

Figure 7 provides an example of a Grade 12 text where words that are present fewer than 4 times in the Grade 1-10 materials have been obscured. Inferring the meaning of the unknown words might not be an easy task for Grade 11-12 students.

Figure 7

Example of a Grade 11-12 text containing the new words with four encounter threshold

Conflict can be described as a **disagreement** among groups or individuals **characterized** by **antagonism** and **hostility**. This is usually fueled by the **opposition** of one party to another in an attempt to reach an objective different from that of the other party. The elements involved in the **conflict** have varied sets of **principles** and values, thus allowing a **conflict** to arise.

Conflict can be **defined** in many ways but one of the simplest is that it **pertains** to the **opposing** ideas and actions of different **entities**, resulting in an **antagonistic** state. **Conflict** is an **inevitable** part of life. All of us possess our own opinions, ideas and sets of beliefs. We have our own ways of looking at things and we act according to what we think is proper. Hence, we often find ourselves in **conflict** in different **scenarios**; it may involve other individuals, groups of people, or a struggle within our own selves. **Consequently**, **conflict** influences our actions and decisions in one way or another.

Conflict comes naturally; the **clashing** of thoughts and ideas is a part of the human experience. It is true that it can be **destructive** if left **uncontrolled**. However, it shouldn't be seen as something that can only cause negative things to **transpire**. It is a way to come up with more meaningful **realizations** that can certainly be helpful to the individuals involved.

Although the required number of word percentages decreases in Grade 8, Grade 9-10, and Grade 11-12, the percentage of unknown words is approximately 7-8% with the four-encounter threshold. Grade 9-10 textbooks have more than three thousand unknown words that cover 6.57% of the text vocabulary, while the Grade 11-12 textbook has a smaller number of unknown words remaining (2351) than Grade 9-10 with a higher percentage of unknown words (8.68%), which is expected given that the Grade 11-12 corpus is half the size of the Grade 9-10 corpus. With a high percentage of unknown words and limited vocabulary resources that we might expect from the students, given the vocabulary to which they have been previously exposed, learners might become demotivated (Aziz et al., 2010) when reading their textbooks following their transitions from one educational level to the next. The expectation that there would be enough time in

the class for the teachers and learners to deal with all of these new words is unrealistic, given that it would require one new word to be dealt with every three to four minutes in the classroom. Even for the highest performing students, this would be a difficult situation, and it might be particularly demotivating for lower-level Bangladeshi students in these classes.

It may be possible for some readers, in some learning contexts, to estimate meanings of new words from the textual context. However, guessing from context is harder for the L2 learners than their L1 counterparts (Nassaji, 2003; Walters, 2006), and guessing is not generally seen as an effective strategy for lower-level learners, particularly when the coverage of known words in a text drops below 95%; instead, this strategy might be more suitable with upper-intermediate and advanced-level learners (Alsaawi, 2013). Considering the Bangladeshi K-12 EFL context, where English language input outside the classroom is minimal or non-existent, the probability of successfully guessing word meanings from the textual context independently is quite low. Increasing the textbook coverage to 95% or more might enable an instructor to scaffold these texts so that the students could then determine the meaning of some of the new words from the context on their own.

5.1.1.5 Additional Factors Affecting Lexical Coverage

There are other additional factors that should be considered when calculating the vocabulary coverage of the textbooks. For example, the effects of studying other academic subjects, the washback effect of tests, and other aspects of the examination system might make complicate the relationship between lexical coverage and vocabulary learning. These other factors could affect vocabulary learning independently of the lexical coverage of the EFL textbooks.

English is not the only subject learners are studying in Grade 6. Students are also required to study eight additional subjects. In the Bangladeshi public education system, students also need to study Bengali, science, mathematics, social studies, and religious studies. From Grade 9, students also need to take discipline-specific courses, such as - Science (Physics, Chemistry, Biology), Humanities (History, Geography, Political science), or Business Study (Accounting, Management, Economics). All these subjects are taught in Bengali and use Bangla-medium textbooks. Since students have to manage all those subjects in their academic life, focusing solely on English (or English vocabulary learning) might not be possible. Besides, Bengali being the medium of instruction in the English classroom also might lower the English input during the English class time.

Another factor that might have a significant impact on teaching and learning in Bangladesh is the washback effect of summative testing on learning and teaching. Bangladesh's education system is highly test-oriented (Sultana, 2019), and since the year-end summative examinations focus only on reading and writing (Sultana, 2018), and do not assess listening and speaking proficiency, little communicative activity is encouraged in the classroom. Therefore, the number of unknown words that students encounter in their school textbooks is far beyond what could be managed by teachers, in part because teachers are required to dedicate a significant portion of their class time preparing learners strategies for answering the specific types of exam items.

Furthermore, comprehension test items based on a reading passage cover 40% of the marks in EFL public exams, and the reading passage used is randomly selected from the prescribed *English for Today* (EFT) textbooks (Sultana, 2018). Therefore, the students focus on memorizing words from selected passages in the classroom. Moreover, in

Bangladesh, class time devoted to English instruction is only 30-45 minutes. Therefore, teaching vocabulary does not receive an adequate portion of class time, and students are not actively motivated to learn vocabulary.

5.1.2 Repetition in Bangladeshi Textbooks

Generally, in EFL textbooks, repetition occurs infrequently (Matsuoka & Hirsh, 2010; Sun & Dung, 2020; Yang & Coxhead, 2020). The findings of this study indicate that this is also the case with Bangladeshi textbooks. Table 14 demonstrates the repetition of words in Bangladeshi textbooks by showing the number of words based on the number of occurrences among all the grade-level textbooks.

Table 14

Number of words per occurrence in Bangladeshi K-12 Sub-corpora

Word Occurrence (# of Times)	Grade 1-5	Grade 1-7	Grade 1-8	Grade 1-9	Grade 1-12
1	359	1295	1538	2008	2297
2	189	608	711	919	1187
3	104	359	429	501	639
4	104	265	332	401	460

In grade-level textbooks (K-12) in Bangladesh, more than two thousand words (2297 words) occurred only once. Even before students proceed to Grades 11-12 (called intermediate college in Bangladesh), the number of words that occurred once in Grade 1-10 textbooks is more than two thousand (2008 words). These words are not likely learned by most students since one encounter is probably not sufficient for form and meaning recognition (Webb & Chang, 2012). Including words that occur only twice to those that appear only once results in a list of more than three thousand words. With three times of

repetition (four occurrences), the number goes way down. Only 460 words have been found three times or more in Grade 1-12 corpus, and 401 words are repeated 3 times or more in Grade 1-10 textbooks. These numbers are very low compared to the prescribed word repetition of eight to ten times to retain words. It is also unclear how much time is spent by teachers explicitly dealing with word meanings in Bangladeshi K-12 classrooms, nor how many words they might focus on during that time.

Although Vidal (2011) opined that 2 to 3 occurrences are sufficient to expedite the learning process, this threshold is likely insufficient for retaining these words. This echoes the results of Pellicer-Sánchez (2016), who concluded that three to four word encounters makes subsequent reading faster, whereas a minimum of eight encounters is probably needed to internalize the words. The requirement for eight to ten encounters to promote word learning provides a more concerning portrayal of word repetition in Bangladeshi K-12 textbooks. Table 15 shows the number and percentage of words with a minimum threshold of 8 and 10 occurrences among all the grade-level sub-corpora.

Table 15*Profile of words occurring at least 8-10 times in Bangladeshi K-12 sub-corpora*

	Grade 1-5	Grade 1-7	Grade 1-8	Grade 1-9	Grade 1-12
Total words	28957	111638	172730	267424	314610
Number of words occurring 8 times or more	529	1304	1695	2290	2647
% of words occurring 8 times or more	1.83	1.16	0.98	0.86	0.84
Number of words occurring 10 times or more	462	1128	1495	2014	2305
% of words occurring 10 times or more	1.59	1.01	0.87	0.75	0.73

Using either an eight or a ten encounter threshold, the absolute number and the percentage of words that are repeated over the entire K-12 EFL curriculum are low. For example, only 2290 words have been repeated eight times or more in the entire Grade 1-10 textbook corpus, which comprises 267,424 tokens in total. These 2290 words that occurred eight times or more represent 0.86% of the words in the 13 textbooks used from grade one through grade ten. While many researchers (Nation & Wang, 1999; Pellicer-Sánchez, 2016; Pellicer-Sánchez & Schmitt, 2010; Pigada & Schmitt, 2006; Vidal, 2010; Webb, 2007) consider eight to ten times as the average number of encounters necessary for retaining a word, it is unlikely that Bangladeshi students will retain a sufficient number of words from incidental vocabulary learning in one stage of learning to be able to make effective use of the next level of English textbook materials.

5.1.3 Lexical Gain

Knowing the number of lexical items students can realistically learn in a year would likely aid material developers and teachers in adjusting the lexical input that is presented to students in textbooks. A comparison can be made between the average number of unknown words that students will encounter per hour in a classroom setting in Bangladesh and the average vocabulary uptake per hour in different EFL contexts. Orosz (2009) studied the vocabulary gain in two primary school EFL contexts: Hungary and Greece. The study concluded that Grade 3-6 students could have mean vocabulary gain from 4.17 to 7.21 lemmas per hour. In addition to that, Milton (2009) compiled a list of vocabulary gains in different EFL contexts. Milton also observed a vocabulary uptake that ranged from a low of 1.7 to a high of 5.4 lemmas per hour.

Taking Orosz's (2009) findings into consideration, the Bangladeshi K-12 sub-corpus coverage presented in this study indicates that the number of new words that Bangladeshi children are expected to manage is higher in many cases compared to the findings of vocabulary gain observed in other foreign language contexts (7.21 lemmas per hour). Barnard's (1961) and Quinn's (1968) findings (1.7-3.3 lemmas/hour), in India and Malaysia, make the number of new vocabulary needing to be learned per hour appear unobtainable. Even if one encounter is considered enough for retaining a word, Grade 6 students would need to learn 12 lemmas per hour; this rate would increase to 16 lemmas per hour if four encounters in the grade 1-5 textbooks are assumed to be sufficient for word learning. Besides, comparing to the results of present study to Milton's (2009) study, the required word numbers in the Bangladeshi EFL context is greater than that of all Milton's studied contexts.

Since the number of English instruction hours in secondary (Grade 9-10) and higher secondary (Grade 11-12) is more than that in the other grades, the number of required word learning per hour is comparatively less in secondary and higher secondary contexts. Using a threshold of four encounters, the number of required words (flemmas) to be learned per hour would be 12 for secondary students and 10 for higher secondary students. In Grade 6 and Grade 8, students would need to learn 16 words (flemmas) and 17 words (flemmas) per hour of instruction, respectively. In both Grade 6 and Grade 8 in particular, these numbers are alarming, and the present study's results would indicate that the gap between the limited number of English instruction hours available and the large number of unknown words presented in course materials should be first recognized and then somehow addressed.

In addition to research that has examined rates of hourly vocabulary gain in different EFL contexts, there have been numerous studies that have also estimated yearly vocabulary gain. Some studies have measured vocabulary gain using the word-family (as opposed to lemma or flemma) as the basic unit of calculation. To compare those studies' results with this study, which used flemma-based calculations, a conversion can be made. The number of unknown flemmas in Grade 6 is 2087 and by putting all these unknown words into Lextutor.ca (Vocabprofilers), it was found that 2087 flemmas are equivalent to 1501 word-families. According to this calculation, one word-family consist of 1.4 flemmas and this estimation is used in this study. A comparison between the number of unknown words in textbooks at each grade-level and the number of words encountered per year in previous studies can be made to get an idea about the new vocabulary load presented in the Bangladeshi EFL textbooks. Webb and Chang (2012) concluded that learners (15-16 years

old) could learn 400 word-families (560 flemmas) in a language program over a seven-week period, while Nurweni and Read (1999) and Quinn (1968) found that the learners learned the 1000-2000 most frequent word-families in six years (223-466 flemmas). On the other hand, lemma-based studies reported learners learning 400-1000 lemmas – or approximately 160-330 word families (224-462 flemmas) – per year (Milton, 2006a, 2006b, Orosz, 2009), where one word family is the equivalent of approximately 3 lemmas.

According to the results of this study, in Bangladesh, the lowest number of unknown words encountered in EFL course texts in one year was found in the Grade 8 textbooks (1160 flemmas), assuming one encounter is sufficient for vocabulary retention. At the other extreme, the highest number of new words encountered in one year was observed in the Grade 9-10 textbook at 3175 flemmas, assuming four encounters as the retention requirement. Three thousand flemmas represent more than 2000 word-families. The Grade 9-10 textbook sub-corpus would present 1738 (considering one-encounter threshold) new/previously unseen flemmas over the two years of instruction, which is the lowest vocabulary load of all the Bangladeshi K-12 textbooks examined in this study. Thus, the new vocabulary load presented in Bangladeshi textbooks is considerably larger than the number of words typically learned in a year in different EFL settings.

One additional aspect needs to be considered when comparing Bangladeshi contexts with other EFL contexts. Some of the previous studies cited above collected their data within private EFL schools. Milton (2009) stated about a Hungarian private EFL school (*Frontisteria*) that private schools are usually more effective in their planning and language input than their public counterparts. Milton proposes that this was probably a contributing factor in the number of words per hour difference between the State school in

Greece and the private school in Hungary. The private school's uptake was better (5.4 words/hour) than that of the public school (4.7 words/hour and 4.4 words/hour). However, other factors unrelated to the public or private school type would likely have contributed to their results, including motivation and the number of instructional hours. Milton (2009) stated that people are not as motivated to learn French in the United Kingdom as compared to people learning English in Hungarian or Greek contexts. However, the number of hours of English instruction was less in both Greek and Hungarian contexts (100-125 hours) than that in the Bangladeshi public K-12 context (128-256 hours).

Notably, the studies mentioned previously were based on the prediction that the students know all the proper nouns, interjections, and abbreviations. The supplementary lists of proper nouns, interjections, and abbreviations that are supplementary-list cover a meager percentage between 1.27 and 1.76 in the four K-12 levels sub-corpora used in this study. Grade 9-10 sub-corpus has 1331 words in the supplementary-lists with a total percentage coverage of 1.38. Supplementary-list words such as proper nouns often reveal their meaning in texts where they are used and "could not be sensibly pre-taught" (Nation, 2001, p.19). Because the number of supplementary-list words in grade-level Bangladeshi textbooks is less than two percent, they might not significantly affect the words' overall coverage. Since many proper nouns in this corpus refer to local geography and culture, they present much less of a barrier to reading comprehension than the on-list lexical words.

Since an effective transition in the early stages of education is essential for teaching and learning success (Blondin et al., 1998), the Bangladeshi EFL textbooks should ideally ensure a smooth transition to different grade-levels. When students go from one stage to another, the language input needs to be comprehensible (i+1) (Krashen, 1989) and should

not be too far beyond the students' reach. An input similar to learners' present competency (i) or lower (i-1) could make learning unengaging and demotivating. Again, input that is beyond a learner's capability (i+2/i+3) can make reading frustrating, thus causing decreased levels of motivation (Mesmer, 2008). Therefore, the input in all stages should be aligned to learners' ZPD (Vygotsky, 1978), so that with proper scaffolding, students can understand the materials and become independent learners. As per the results of this study, the current condition of vocabulary transition requires modification to reflect the proper use of i+1 or ZPD. The vocabulary load in the class materials of each stage of Bangladeshi K-12 education far surpasses the vocabulary load that scholars have suggested to be realistic. In the classroom, teachers' use of scaffolding may be insufficient in assisting learners in reaching subsequent zones of development simply because there is not sufficient class time available. In addition to these large number of unknown words that are introduced in each subsequent level, factors like the test washback and the demands of other school subjects make the situation more complex. Curriculum designers, material developers, and teachers need to work together and develop solutions that might make the Bangladeshi learners' English education journey easier.

5.2 Research Question 2: To what extent do K-12 Bangladeshi textbooks prepare students for university education in terms of vocabulary coverage?

There are variety of factors that cause the transition to post-secondary education challenging. This study aimed to examine how challenging it is for Bangladeshi students who approach higher studies in and outside of their home country. Since outward mobility (i.e., students studying abroad) is evident among Bangladeshi undergraduate and graduate students, it is worth finding out how to adapt to the textbooks' language in their first year of university. Three disciplines have been investigated in this study- English Literature, Commerce, and Engineering. English Literature degrees are in high demand in Bangladesh, as these degrees create many job opportunities, and learning English is a matter of prestige. Commerce (or business) and Engineering are popular disciplines for international students in Canadian universities (Wood & Appel, 2014).

5.2.1 Coverage of First-year University Literature Textbooks

Considering one encounter threshold, Grade 1 to 12 Bangladeshi textbook words cover 92.6% of English Literature textbook sub-corpus (3 textbooks), leaving 12016 unknown words for the new first-year students. Figure 8 shows an example of a text from one of the English Literature textbooks (History of English Literature) where words that are not present in the Grade 1-12 English textbooks have been obscured. For a new Bangladeshi university student who just graduated from Grade 12, understanding a text like this might be difficult.

Figure 8

Example of a Literature text containing the new words with four encounter threshold

Before the novel could reach its modern stage, of a more or less **sincere** attempt to express human life and character, it had to pass through several centuries of almost **imperceptible** development. Among the early **precursors** of the novel we must place a collection of tales known as the Greek **romances**, dating from the second to the **sixth** centuries. These are **imaginative** and **delightful** stories of ideal love and **marvelous** adventure, which **profoundly** affected **romance** writing for the next thousand years. A second group of **predecessors** is found in the Italian and Spanish **pastoral romances**, which were inspired by the Eclogues of Virgil. These were extremely popular in the **fourteenth** and **fifteenth** centuries, and their influence is seen later in Sidney's **Arcadia**, which is the best of this type in English. The third and most **influential** group of **predecessors** of the novel is made up of the **romances** of **chivalry**, such as are found in Malory's Morte d'Arthur. It is **noticeable**, in reading these beautiful old **romances** in different languages, that each nation changes them somewhat, so as to make them more **expressive** of national **traits** and ideals. In a word, the old **romance** tends **inevitably** towards **realism**, especially in England, where the **excessive** imagination is **curbed** and the heroes become more human.

Note: Proper nouns are not obscured since we assume that students would know the proper nouns.

With four encounter threshold, the lexical coverage percentage of Literature textbooks goes down to 87.5% leaving more than sixteen thousand unknown words. Among the three Literature textbooks, History of English Literature textbook has the lowest number of unknown words (3952 flemmas) with one encounter threshold. Four encounter threshold increases the number of unknown words in the History of English Literature textbook to 6118 flemmas.

5.2.2 Coverage of First-year University Engineering Textbooks

With the same coverage percentage (92.6%) of Literature textbooks, the Engineering textbook sub-corpus (5 textbooks) leaves students with 3778 new words in their first-year of study (considering one encounter threshold). Figure 9 presents a text from one of the Engineering textbooks (Physics) where words that are not present in the Grade 1-12 English textbooks have been obscured. Since the important content words (e.g., the first word of the passage) is not encountered by the Bangladeshi students in their K-12 textbooks, understanding the passage might be difficult for new first-year university students.

Figure 9

Example of a Physics text containing the new words with four encounter threshold

Gravity is certainly one force acting. The other forces acting on the **climber** at rest are either contact forces that act **perpendicular** to the rock surfaces or **friction** that acts along those surfaces. As the **chimney** walls are **vertical**, the normal forces will not oppose **gravity**. However, that does not mean they are not present and that they are not important to this problem. In particular, the maximum **magnitude** of **static friction** is **proportional** to the normal force, and **friction** can act **vertically** in this case and in a direction that **cancels gravity**. By pushing with his feet and back into the walls, the normal forces at the walls are increased, and that has the positive effect of increasing the **friction** forces on the **climber**. These forces will **cancel gravity** and allow the **climber** to be in **equilibrium**. The technique of pushing the walls within **cracks** such as this is **instinctive** and effective.

Although the coverage percentage is similar to that seen in Literature and Engineering textbooks, the supplementary lists' percentage tells a different story. While Engineering textbooks contain 9.02% of supplementary-list words (31796 tokens), Literature textbooks have more than 11% of supplementary-list words (84214 tokens). The larger size of the Literature sub-corpus resulted in a bigger number of supplementary

words compared to the Engineering sub-corpus. However, the most significant difference between the Literature and Engineering sub-corpora is the number of proper nouns in them. Literature textbooks have more than 45 thousand words in the proper noun category due to the names of poets, novelists, and playwrights and the names of their many works, and the characters and places described in these works. People and place names occur repeatedly in Literature textbooks resulting in a considerably higher number of proper nouns compared to the other sub-corpora. On the other hand, Engineering textbooks tend to include more factual details and as such, have fewer proper nouns (2455 tokens).

As far as individual textbook coverage in this study is concerned, for Engineering and Literature, the percentage of the textbook vocabulary covered by K-12 textbook words was in the low 90s, similar to their overall coverage. Chemistry and Programming textbooks' coverage percentage is closer to the required 95% threshold, assuming one encounter is enough for retaining a word in K-12 textbooks. Only the Physics textbook surpassed 95% (96.9%). However, the minimum four encounter threshold results in the percentage coverage are down significantly (87.8%), especially for Physics textbooks that require learners to learn 4278 new words. Interestingly, using the four encounter threshold assumption in the Chemistry and Programming textbooks, although the coverage percentage goes down to 88.8% and 89.5%, respectively, the number of total new word encountered is low: only 334 in Chemistry and 64 Programming. Students might be comfortable learning with these textbooks despite having a lower coverage since the total number of words is fewer, as might be expected for these subjects, where textbooks use less prose than those in the humanities and social sciences.

5.2.3 Coverage of First-year University Commerce Textbooks

The first-year university Commerce textbooks' vocabulary is covered to a higher degree (94.5%) by K-12 vocabulary than that of two other university subject sub-corpora (Literature and Engineering) considering one encounter threshold for vocabulary retention. Moreover, Commerce textbooks are also covered by a higher vocabulary coverage percentage (89.9%), assuming four encounters as the threshold, as compared to the coverage of Engineering (88.1%) and Literature (87.5%) textbooks. Figure 10 portrays a text from one of the Commerce textbooks (Financial Accounting) where words that are not present in Bangladeshi K-12 English textbooks have been obscured. As it is shown, there are many content words hidden, and this might present a problem for the first-year university students to understand texts such as this one. Students will likely have to use a dictionary to get the meaning of the words, and that might be a time-consuming and tedious task.

Figure 10

Example of an Accounting text containing the new words with four encounter threshold

As a third alternative, you might organize as a **corporation**. A business organized as a separate legal **entity** owned by **stockholders** is a **corporation**. **Investors** in a **corporation** receive shares of **stock** to indicate their **ownership** claim. Buying **stock** in a **corporation** is often more attractive than **investing** in a **partnership** because shares of **stock** are easy to sell (transfer **ownership**). Selling a **proprietorship** or **partnership** interest is much more involved. Also, individuals can become **stockholders** by **investing** **relatively** small amounts of money. Therefore, it is easier for **corporations** to raise funds. Successful **corporations** often have thousands of **stockholders**, and their **stock** is traded on organized **stock** exchanges like the New York **Stock** Exchange. Many businesses start as **sole proprietorships** or **partnerships** and eventually incorporate. For example, in 1896 Leo **Hirshfield** started **Tootsie** Roll as a **sole proprietorship**, and by 1919 the company had incorporated.

Among the Commerce textbooks, Macro-economics and Globalization textbooks are covered to a higher degree by K-12 vocabulary (94.6% and 96.3%, respectively). The

globalization textbook maintained the highest coverage using four encounters as the threshold, while Linear Algebra (85.5%) and Financial Accounting (86.6%) had the lowest coverage percentage among Commerce textbooks. Despite the higher vocabulary coverage percentage of Commerce textbooks in general, the total number of unknown words in these texts is still high. While a 94.5% vocabulary coverage with one encounter threshold leaves 6198 unknown words across the sub-corpus, with the four encounter threshold, that number goes up to 9047 unknown words. In the case of the supplementary word-list, the Commerce textbook has the lowest number (28,936 words) of supplementary words among all the three university disciplines.

In a university-level textbook, it is to be expected that many of the new words encountered by students would be technical and/or subject-specific words that would be learned in the course through class lectures, from the subject-expert teacher. However, the Academic Word List (AWL) or General Service List (GSL), which are non-technical and general English word lists, both suggest that non-technical words are not included in the K-12 Bangladeshi textbooks properly. University words that are absent in K-12 textbooks were run against the AWL and GSL. It has been found that many non-technical words were not present in K-12 textbooks. Some of the non-technical AWL and GSL word examples are provided in appendices (see Appendices A, B, and C). For example, words such as *thumb*, *pink*, *attain*, *fault*, *hitter*, *icy*, *multiply*, *silk*, and *calmly* in university textbooks are not genre-specific vocabulary. Those are general words and missing in the K-12 textbooks. K-12 textbook designers should consider the amount of non-technical general words in the K-12 textbooks in Bangladesh and include a considerable amount of

those general words in the K-12 textbooks to support students pursuing post-secondary education.

Since the university semester does not run year-long (as K-12 programs do), it is also essential to consider which courses or textbooks will be suitable for the new students in their first year of university life. In Bangladesh, public universities usually have a rigid curriculum where students do not have the flexibility to choose courses; all students are in cohorts that take the same courses. However, in some private universities in Bangladesh and at overseas universities, students may be able to make their own choices if a given course is not mandatory to finish by the first semester. In Engineering and Commerce, textbooks such as Engineering Mechanics, Calculus, or Financial Accounting might be more suitable for later semesters or later years than first-year first-semester for Bangladeshi students.

Overall, the number of unknown words in the university sub-corpora is a mountain to climb for the new first-year university students since there is a limited number of time per semester. According to the results of the present study, the majority of first-year university textbooks are not approachable by students who have come from Bangladeshi K-12 programs. Universities in Bangladesh should prescribe textbooks that are more appropriate for these students, and more importantly, the K-12 textbooks need to support the students to make their future educational pursuits a success.

5.3 Limitations of the Study

One of the notable limitations of this study is that many of the proper nouns and abbreviations of the K-12 textbooks were removed prior to analysis. The importance of proper nouns was also considered to be context-specific, and they are not suitable to be pre-taught (Nation, 2001). However, having all the proper nouns and abbreviations could have allowed me to analyze the vocabulary coverage with and without the supplementary lists, and this would have made the analyses more comparable to those of others, such as Yang and Coxhead (2020). Moreover, this study did not include textbooks representing all university education disciplines and did not incorporate all the textbooks used for the three targeted disciplines examined in this study. Therefore, a generalization of results might not be possible in all contexts. Furthermore, the grammar textbook used in Grade 12 was omitted as it was not available.

A second limitation of this study was that it did not consider other vocabulary learning and teaching factors in addition to that of lexical coverage. Students might have exposure to language and vocabulary from different sources and may be able to learn vocabulary outside the textbook. This study also did not include the participation of teachers or students in the Bangladeshi context. Interviewing or observing teachers or students could provide more opportunities for data triangulation and could produce stronger results. Another limitation is that this study did not include all three types of the curriculum: Bangla medium (all textbooks are in Bengali except English textbooks), English version (all Bengali medium textbooks are translated to English except the Bengali textbook), and English medium (British curriculum), and only focused on English medium textbooks. Finally, this study only focused on the textbooks' vocabulary coverage while

other important aspects of a textbook need to be examined, such as grammar, idioms and metaphors, lexical bundles, multiword constructions, and formulaic language.

5.4 Pedagogical Implications

This study has implications for different stakeholders in both Bangladeshi and other EFL contexts. Materials developers, textbook designers, researchers, and teachers in EFL contexts can use the study results to improve their research, practice, and decision-making process. For material developers and textbook designers in EFL contexts, this study's results might indicate the need for systematic vocabulary input in textbooks. Since EFL learners do not get the exposure to English language like other contexts, and textbooks are the primary source of input, this study may help textbook designers recognize the gap in vocabulary instruction at different levels of education. The number of unknown words in different stages provides an estimation of what to include and when to include it. Based on the vocabulary gap that is found in this study, material developers might think of adding other modes of input (e.g., listening, viewing) in addition to reading to provide more language input to students. Teachers could be trained to use multimedia in the classroom so they can use audio and video in the classroom to enhance the type and amount of language exposure. Moreover, students can be given listening or viewing tasks as homework that they can access through mobile apps since the use of mobile phone and internet has become very common in Bangladesh and around the world.

Textbook designers may become more aware of the importance of vocabulary repetition in providing learners with enough exposure to learn the vocabulary, and this should enable them to take more strategic approaches to choosing texts that are appropriate to student level, and to incorporating pedagogical strategies for managing efficient

vocabulary growth. Managing the amount of and the kinds of unknown vocabulary that are in the texts used in the textbooks might improve the probability that learners will acquire this vocabulary incidentally, and it might also assist teachers to explicitly focus on certain important vocabulary can enable students to get closer to the necessary 95% coverage as they progress through the education system. Deliberate vocabulary learning programs can be implemented in Bangladesh, and these might include the use of vocabulary supplementary resources at the beginning of the year. Such vocabulary supplements could focus on the important words that students had not encountered in their previous stages of education. For incidental learning of unknown vocabulary, extensive reading programs could be introduced where students would encounter such words repeatedly in meaningful contexts. Teachers could also deliberately incorporate target words into their lectures to boost learners' vocabulary input strategically.

Researchers from Bangladesh and other EFL contexts can conduct studies that are similar to this one in different contexts or countries to see how their textbooks prepare the learners for different stages of education. So far, vocabulary issues have been investigated in university students' writings in Bangladesh and the conclusion of those studies suggested that insufficient vocabulary knowledge is a barrier for university students (Afrin, 2016). Additionally, it is not currently standard practice for teachers or administrators to do a needs analysis of students vocabulary (Jahan & Jahan, 2011). Since this study shows the gap between Bangladeshi K-12 textbooks' vocabulary and university level textbooks' vocabulary, teachers could begin to do such a needs analysis by testing for knowledge of the most useful (i.e., frequent in target corpora) words that students have not already encountered in their K-12 textbooks. This type of study would also, presumably,

corroborate (or refute) the main findings of the present study. University authorities might also suggest course placement recommendations in the early semesters based on the results of those needs analyses. Students whose academic reading proficiency and whose knowledge of general academic vocabulary might, for example, be recommended to delay taking certain language-heavy courses until later in their program. Courses that use textbooks that display higher coverage percentage by K-12 vocabulary can be offered earlier than those with textbooks with a lower coverage percentage. Students and academic advisors can also choose and advise students to take courses strategically based on their language proficiency and vocabulary knowledge. This study's results can thus enhance the needs analysis process that is an essential component of material development.

Another important implication of this study is the use of corpus analysis tools to provide researchers with the opportunity to handle large data sets and make the comparison of data easier. The use of tools such as Antwordprofiler (Anthony, 2014) can provide valuable insight to the researchers, and they can use pre-existing word lists that are by default attached to the software or any custom-made list. Using corpora can inform the researchers about the authentic written and spoken language used in the real world. Besides the researchers, teachers can be trained to use corpus tools such as Lextutor or Antwordprofiler so that they can find out the words that are low frequency and teach students those words deliberately. With carefully designed word lists, the most useful words could be categorized separately from technical words, and also from words that might be deemed less useful for learners who plan to study in specific post-secondary programs.

Most importantly, L2 teachers can learn which words from this study need to be pre-taught and which can be learned through the incidental process. If a teacher knows challenging vocabulary will be required for their students to participate in a subsequent class, they can prepare students in advance and offer additional guidance. Moreover, a reliable estimation of teaching vocabulary can make the teaching and planning process easier for teachers since they can use this knowledge to plan their lessons according to learners' needs. Lastly, if the teachers and the students can learn how to use corpus tools, they can quickly check the lexico-grammatical features of their writing, which will make the tracking of learners' progress easier.

Finally, government authorities (e.g., national textbook board) address the issue of the gap of vocabulary input in different stages of learning in Bangladesh from this study. Considering the results of this study, expert opinions and examples from other countries (e.g., Hungary), government can plan to make vocabulary acquisition easier for the students. The vocabulary gap described in this study can guide the decision making process about vocabulary teaching and learning for Bangladeshi authorities and other EFL contexts.

5.5 Recommendations and Future Research

Due to the lower rate of lexical coverage that textbooks in Bangladesh provide to materials used in higher levels of education, it is recommended that the education ministry, textbook board, and material developers plan to provide students with a more efficient learning system. A government target or plan of lexical needs for the students can be laid out, such as the one in Hungary. Figure 11 shows the target vocabulary numbers for different stages of education in Hungary. The National Core Curriculum in Hungary has a

vocabulary guideline for grade-level students (Orosz, 2009). Hungarian authorities have made a guideline for active and passive vocabulary numbers where active vocabulary is the vocabulary students are expected to produce, and the passive vocabulary is the vocabulary that is expected to be recognized. For example, they have made an estimation that by Grade 12 students need to know 3250-3750 words and they also planned for the lower grades' vocabulary learning target.

Figure 11

Target vocabulary in Hungary (Orosz, 2009)

	<i>3rd grade</i>	<i>4th grade</i>	<i>5th grade</i>	<i>6th grade</i>	<i>7th grade</i>	<i>8th grade</i>	<i>10th grade</i>	<i>12th grade</i>
Active vocabulary	200	350	500	600	800	1200	B1 CEF level (2750–3250)	B2 CEF level (3250–3750)
Passive vocabulary	150	150	200	250	300	400		
Active & passive vocabulary	350	400	700	850	1100	1600		

In Hungary, this national vocabulary learning initiative resulted in a better way, especially for lower-level learners (Orosz, 2009). This list might provide a base for the Bangladeshi EFL context to set a target for language learners' vocabulary input. Although this vocabulary guideline is not absolute for every EFL context, Bangladesh can make a vocabulary guideline to give material developers a realistic and attainable estimate about the required vocabulary to include in the textbooks. Another possible way to meet the vocabulary needs could be through the addition of a separate vocabulary learning and/or reading program besides the regular English classes to intentionally expose the students to the vocabulary. Moreover, a reading for pleasure program can be initiated so that students

get more input through reading outside the classroom. The government can also include other modes of input like listening or viewing so they can enhance learning vocabulary incidentally.

Research can be done to make a link between the K-12 textbooks' vocabulary and university textbooks' vocabulary. Since university textbooks contain subject-specific vocabulary, it is not possible to include the subject-specific vocabulary in K-12 textbooks. However, more generalized vocabulary (i.e., non-technical/not subject-specific) from university textbooks can be added to the K-12 textbooks. To find out the generalized list of words, the university words that are absent in the K-12 corpus can be analyzed through a word profiler program. Those generalized words can then be taught in the K-12 education system to provide more support to the new university students.

Additional research needs to be conducted in the field of education in Bangladesh. Bangladeshi English language learner corpora could help researchers and material developers to decide what language one could expect from Bangladeshi English language learners. Corpora of Bangladeshi English language learners' written and spoken language could also be compiled to see their language and common errors. Frequency-based word lists could be made from Bangladeshi learners' written and spoken corpora so that researchers, teachers, material developers, and students can use those word lists to fulfill their own needs. Moreover, additional textbook vocabulary analysis could be done using lemma, flemma, and word family units to get an understanding of how each calculated unit affects the study's result. More disciplines and textbooks could be added to obtain a more generalized idea about the transitions in Bangladeshi EFL contexts. Future studies could also investigate language comprehension in the Bangladeshi EFL context using different

input methods (reading, listening, and viewing) similar to Feng and Webb (2020). Since reading is currently the most prominent manner of input in the Bangladeshi EFL context, it would be beneficial to investigate how other input modes contribute to learning EFL contexts. To receive a different understanding of how language comprehension occurs in this context, participants (e.g., teachers, students, guardians, educationists, government officials, textbook designers) could be included in the study. These stakeholders could be interviewed, and data could be analyzed qualitatively. Additionally, measures such as classroom observations could contribute and expand future research. For further textbook analysis, other aspects (e.g., grammar, formulaic language) besides vocabulary could be analyzed to get a full picture of the textbooks. Scholars have conducted studies separately on these aspects (Biber & Reppen, 2002; Forssten et al., 2014; Hsu, 2014a; Šegedin, 2008; Wood & Appel, 2014) in different learning contexts and countries. Additional studies can be conducted on each of these aspects of Bangladeshi EFL textbooks. Further study could include investigating textbooks of three different types of curricula (Bengali medium, English version, and English medium) in Bangladesh, and see how these different curricula affect language learning.

Chapter 6: Conclusion

This study examined the lexical coverage of Bangladeshi EFL textbooks at different stages of K-12 education. Furthermore, this study investigated the transition to university education for Bangladeshi students in terms of vocabulary coverage. To examine the lexical coverage in the K-12 system, four critical stages in the Bangladeshi education system were identified, and the transition from one stage to another was examined. For the transition to tertiary education, K-12 textbook vocabulary was compared with first-year university textbooks from three disciplines: business, Engineering, and English Literature. In addition to addressing the research questions, this thesis also provided recommendations for the betterment of textbook vocabulary input. Pedagogical implications of this study, and suggestions for future research and limitations were also discussed.

To address the first research question, the Grade 1-5 textbook sub-corpus was compared to the Grade 6 textbook sub-corpus, the Grade 1-7 sub-corpus was compared to the Grade 8 sub-corpus, the Grade 1-8 sub-corpus was compared to the Grade 9-10 sub-corpus, and the Grade 1-10 sub-corpus was compared to the Grade 11-12 sub-corpus. To address the second research question, the entire K-12 textbook sub-corpus was compared to first-year university textbooks' vocabulary from three disciplines (Literature, Engineering, and Commerce). To address both questions, the coverage percentage was discussed with the evidence from previous literature. Scenarios were investigated considering the number of exposures students need to retain a word in the long-term memory.

This study suggests that the Bangladeshi textbooks' vocabulary input was not planned according to the students' language level, and that students will have to bridge a considerable gap in vocabulary knowledge if they only rely on the vocabulary input of textbooks they are required to use. This study's results support the previous findings (Hsu, 2013; Mohamad & Puteh, 2017) regarding vocabulary input in textbooks. Vocabulary input should be revisited to provide students adequate vocabulary to be successful in their study. Especially, Grades 1-5 and Grade 1-7 textbooks' vocabulary should be upgraded because the vocabulary coverage gap between Grades 1-5 and Grade 6, and Grade 1-7 and Grade 8 is immense, and that gap would be hard to fill with the limited class time students get in a year. This scenario is almost the same in other K-12 stages in the Bangladeshi context. Similar to that of the K-12 stages, the transition from high school to university is also problematic. Most first-year university textbooks demanded exceedingly high amounts of vocabulary knowledge for learners to reach to the recommended coverage of 95%. Although some of the textbooks can be taken in the first year of university study, most of the textbooks or courses should be studied at a later stage of university education with more vocabulary knowledge.

This study also addressed the repetition of words in the Bangladeshi EFL textbooks needed to learn vocabulary incidentally. Although many researchers (Elgort & Warren, 2014; Nation & Wang, 1999; Pellicer-Sánchez and Schmitt, 2010; Pigada & Schmitt, 2006; Webb, 2007) recommend ten repetitions or more for internalizing a word, Bangladeshi EFL textbooks did not provide sufficient repetition. Instead, the majority of words occurred one or two times which is well below the recommended amount. Pellicer-Sánchez's (2016) recommendation of three to four encounters to make reading faster put

the textbooks' coverage to very low. This also impacts the possible vocabulary growth that EFL students are expected to have. Since the number of unknown words goes up with three to four encounter criteria, the average vocabulary per hour/per year goes up, and compared to other research (Cobb & Horst, 2001; Danelund, 2013; Milton, 2006a, 2006b; Nurweni & Read, 1999; Orosz, 2009; Quinn, 1968; Webb & Chang, 2012) examining vocabulary growth, the required amount of vocabulary per hour/per year is beyond the reach of any student.

Corpus tools are available to measure the number of words and their distribution easily. Authorities in EFL contexts, including Bangladesh, should examine vocabulary input in K-12 textbooks and align the K-12 vocabulary with university textbook vocabulary so that students can approach higher education with greater ease and confidence.

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Appendices

Appendix A

University Engineering Textbook GSL and AWL Supplementary-List words (Partial)

angled	informally	stiffness
awkward	inquiries	straight
baking	inward	straightens
berry	loosely	tempting
blade	loudness	thinness
blades	multiplication	thumb
broadcasting	multiplied	tighter
convenience	multiply	unbalanced
conveniences	multiplying	unloaded
convenient	mystery	weakly
cooker	nonsensical	wire
cork	oar	wires
curiously	oars	accumulation
customary	peculiar	adaptable
damaging	peculiarity	adaptation
damper	persuasion	adaptive
diamond	pink	aggregate
diamonds	preferential	aggregates
drag	programming	alteration
elasticity	purely	ambiguities
electrically	rake	ambiguity
enclosure	razor	ambiguous
essence	reflective	analogies
essentially	replacement	analogous
excess	roast	analogy
excessive	rusted	analytic
explosion	satisfying	analytically
explosions	shallower	appendix
fasteners	sharply	appreciably
fault	sharpness	approximation
grinding	silk	approximations
ideally	slight	arbitrariness
immensely	smoothly	attain
improbable	spoonful	attained
impurity	steeper	attain

Appendix B

University Commerce Textbook GSL and AWL Supplementary-List Words (Partial)

advisors	customary	grind
advisory	daring	harmless
affordable	defender	hitter
attractiveness	dissatisfaction	holiest
avenue	dissatisfied	honestly
avoidable	donkeys	humbly
baking	earnings	icy
barber	elasticity	ideally
berries	electrician	imitation
blade	electricians	imitations
blindly	essence	immensely
bottled	essentially	incorrectly
brass	excess	infrequently
broadcasting	excessive	inn
caged	explorer	inquiries
cautiously	explorers	inquiring
charmingly	explosion	inquiry
cheating	explosions	insiders
civilize	explosive	insulting
cleverly	fading	insurance
coarse	fancier	insure
complicate	fastener	insured
complicates	fasteners	intent
confession	fatten	intentionally
confidently	fault	inward
consciousness	faulty	irresponsible
convenience	fiercest	loosely
conveniences	flaming	luckiest
convenient	flatten	luckily
copying	flattening	madman
corks	flavoring	mistakenly
cowardly	fondness	modestly
creamed	foolishness	multiplied
criminally	gallon	multiplies
critic	gallons	multiply
critics	governmental	multiplying
cushioning	granddaughter	mysteries

Appendix C

University Literature Textbook GSL and AWL Supplementary-List Words (Partial)

advertiser	cleanness	persuasion
aimless	cleverly	persuasively
aimlessness	cleverness	pinker
angled	cliff	postpone
angling	loosely	preacher
angrily	loudness	preachers
applause	madder	preferable
attendant	madman	pretence
avenue	merrily	programming
awaken	miller	sharply
awkward	miserably	sheltered
barber	mistakenly	shields
berry	modestly	shilling
bitterness	modesty	shillings
blade	multiplication	sickly
blades	multiplied	silk
blameless	multiplies	skilful
blindly	multiply	skilfully
blindness	multiplying	skirts
boastful	murderer	slight
boldness	murderers	smoothly
boney	mysteries	solemn
bottled	mystery	solemnly
bowling	narrowly	solidly
brass	nesting	sour
breathless	nonsense	splendidly
breathlessly	nonsensical	splitting
browning	oar	stiffness
caged	oars	stocking
calmly	offensive	stockings
calmness	padding	strictness
cautiously	pairing	stuffing
ceremonial	parentage	suspicious
chained	pasting	swearing
cheers	peculiar	swell
cheery	peculiarities	swells
civilisation	peculiarity	swollen
civilize	peculiarly	
civilizing		

Appendix D

NCTB Website for Textbook Download

বাংলাদেশ জাতীয় তথ্য বাতায়ন অফিসের ধরণ Go Search English

জাতীয় শিক্ষাক্রম ও পাঠ্যপুস্তক বোর্ড (এনসিটিবি)

এনসিটিবি সম্পর্কে শিক্ষাক্রম পাঠ্যপুস্তক শিক্ষক সহায়িকা আইডিটি ও ই-লার্নিং আইসিটি নোটিশ ও মিডিয়া যোগাযোগ

Text size A A A Color C C C C

সর্ব শেষ হাল নাগাদ: ৯ আগস্টের ২০২০

বঙ্গবন্ধু শেখ মুজিবুর রহমান

২০২০ শিক্ষাবর্ষের মাধ্যমিক স্তরের নবম ও দশম শ্রেণির পাঠ্যপুস্তক

ক্রমিক	পাঠ্যপুস্তকের নাম	বাংলা ভাষন	ইংরেজি ভাষন
১।	বাংলা সাহিত্য		
২।	বাংলা সহপাঠ		
৩।	বাংলা ভাষার ব্যাকরণ		
৪।	English for Today		
৫।	গণিত		
৬।	English Grammar and Composition		
৭।	তথ্য ও যোগাযোগ প্রযুক্তি		

“ সরকারী কর্মচারীদের জনগণের সাথে মিশে যেতে হবে। তাঁরা জনগণের খাদেম, সেবক, ভাই। তাঁরা জনগণের বাপ, জনগণের ভাই, জনগণের সন্তান। তাঁদের এই মনোভাব নিয়ে কাজ করতে হবে।
- জাতির পিতা বঙ্গবন্ধু শেখ মুজিবুর রহমান

চেয়ারম্যান

বাংলাদেশ জাতীয় তথ্য বাতায়ন অফিসের ধরণ Go Search English

জাতীয় শিক্ষাক্রম ও পাঠ্যপুস্তক বোর্ড (এনসিটিবি)

এনসিটিবি সম্পর্কে শিক্ষাক্রম পাঠ্যপুস্তক শিক্ষক সহায়িকা আইডিটি ও ই-লার্নিং আইসিটি নোটিশ ও মিডিয়া যোগাযোগ

Text size A A A Color C C C C

সর্ব শেষ হাল নাগাদ: ৭ অক্টোবর ২০২০

বঙ্গবন্ধু শেখ মুজিবুর রহমান

২০২০-২১ শিক্ষাবর্ষের উচ্চ মাধ্যমিক স্তরের একাদশ-দ্বাদশ শ্রেণির পাঠ্যপুস্তক

ক্রমিক	পাঠ্যপুস্তকের নাম	পিডিএফ
১	সাহিত্যপাঠ	
২	সহপাঠ	
৩	English for Today	
৪	তথ্য ও যোগাযোগ প্রযুক্তি	

“ সরকারী কর্মচারীদের জনগণের সাথে মিশে যেতে হবে। তাঁরা জনগণের খাদেম, সেবক, ভাই। তাঁরা জনগণের বাপ, জনগণের ভাই, জনগণের সন্তান। তাঁদের এই মনোভাব নিয়ে কাজ করতে হবে।
- জাতির পিতা বঙ্গবন্ধু শেখ মুজিবুর রহমান

চেয়ারম্যান

Appendix E

Class Routine for Grade 9

BANGLADESH INTERNATIONAL SCHOOL & COLLEGE
DOHS, Mohakhali, Dhaka Cantonment
Class Time Table-2020
Class : IX(C)

Pd	1 st	2 nd	3 rd	4 th		5 th	6 th	7 th	8 th
Days	8:00-8:40	8:40-9:20	9:20-10:00	10:00-10:40		11:05-11:45	11:45-12:25	12:25-01:05	01:05-01:45
SUN	ICT (MA)	Phy (MA)	Chm (AJ)	Bangla-2 (BS)	B R E A K	English-2 (MM)	BGS (TA)	Math (EM)	Bangla-1 (RR)
MON	Chm (AJ)	English-1 (NS)	Bio (SA)	C.Edu (SS)		H.Math (AZ)	Bangla-1 (RR)	ICT (MA)	P.Ed. (DV)
TUE	Phy (MA)	English-1 (NS)	Bangla-2 (SA)	H.Math (AZ)		Bio (SA)	Chm (AJ)	IME (GA)	Math (EM)
WED	BGS (BR)	IME (GA)	Bangla-1 (RR)	Math (EM)		P.Ed. (DV)	English-2 (MM)	H.Math (AZ)	Practical
THU	Bio (SA)	Math (DL)	English-1 (NS)	Phy (MA)		Bangla-2 (RR)	English-2 (BP)	BGS (BR)	IME (GA)

Class Load – 40

Bangla-I = 3
Bangla-II= 3
English-I= 3
English-II= 3
Math = 4
H.Math = 3
ICT=2

B. Studies = 3
Physics = 3
Chemistry= 3
BGS = 3
Bio = 3
Phy.Edu. =2
Cr. Edu= 1
LAB =1