

## **Preposition Phrase Expressions: A Corpus-Based Study of Lexical Bundles in Pakistani Textbooks**

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### **Abstract**

Recurring strings of words known as lexical bundles (LBs) such as *on the other hand*, *at the end of*, are a significant defining feature of academic discourse and important constituents of fluent linguistic production. Although neither idiomatic nor complete grammatical structures, lexical bundles function as basic building blocks of discourse. It is a general perception that Pakistani students at the higher secondary school level are not well aware of lexical bundles used in academic writing. They are thus presumably not proficient enough in utilizing lexical bundles in academic discourse. Lexical bundles in different genres have been extensively studied in relation to written and spoken language. However, little research has been conducted to explore the occurrence, nature, and frequency of lexical bundles in Pakistani academic discourse, especially in textbooks. The present study therefore aimed to investigate four-word Prepositional Phrase lexical bundles used in Pakistani higher secondary school textbooks in order to explore their numbers, frequencies and functional taxonomies. For data collection, specialized corpora were built from the textbooks of physics and chemistry used at a higher secondary school (HSC) level. AntConc (3.5.2 windows 2018) software was used for the extraction of the bundles. The study found twenty common core preposition phrase expressions or lexical bundles. The respective lexical bundles have been analyzed functionally and examples have been taken from textbooks. The findings related to frequent strings of words and their possible variations in use have great pedagogic implications for teachers of English in general, English for academic purposes: for HSC level learners and specific academic purposes: enriching writing in relation to physics and chemistry. The study recommends using lexical bundles to enhance students' academic writing and their ability of comprehending different types of texts.

Keywords: corpus-based study, English for academic purposes, English language teaching, lexical bundles, Pakistani textbooks, preposition phrase expressions

### **1. Introduction**

Lexical bundles are those strings of words which recur in a text more than expected such as *on the other hand*, *at the end of*. Initially, lexical bundles (LBs) were identified and explored by Biber, Johansson, Leech, Conrad, and Finegan (1999) as “bundle of words that show a statistical tendency to co-occur” (p. 989) and as “recurrent expressions, regardless of their idiomaticity and regardless of their structural status”(p. 990). In the existing literature, many terms have been used to refer to LBs such as lexical chunks (O’Keeffe, McCarthy, & Carter, 2007), lexical phrases (Nattinger & DeCarrico, 1992), prefabricated structures (Yousaf & Shehzad, 2018), n-grams (Stubbs & Barth, 2003), formulaic sequences (Schmitt & Carter, 2004; Wray, 2002), multi-word expressions (Siyanova-Chanturia & Martinez, 2014) and lexical

bundles (Biber & Conrad, 1999). All the above-mentioned expressions are used to refer to recurring multi-word units known as LBs.

There are certain parameters to identify LBs. For three-word LBs, they must appear ten-times per million words, for four-word LBs, they must appear five-time PMWs, in more than a single text within a register (Biber et al., 1999). The appearance of LBs in more than a single text within a register is important in order to guard against peculiar features of the individual writer. LBs are the most frequent, constituting and significant units of academic discourse; they are also known as basic building blocks, markers of proficiency and significant components of fluent linguistic production in academic discourse (Hyland, 2008b). Cortes (2004) states that frequent utility of LBs illustrates “competent language use within a register to the point that learning conventions of register use may in part consist of learning how to use certain fixed phrases” (p. 398). LBs help in shaping meaning in a particular text and context; they also add to our sense of coherence in a text from a particular discourse (Hyland, 2008a).

Textbooks are the essence of the academic discourse; in Pakistan they are considered authentic and valid. Textbooks present “the authorized version of a society’s valid knowledge” (Olson, 1989, p. 238). Moreover, textbooks play a vital role in disseminating academic knowledge. Both teachers and students are reliably dependent on textbooks. Therefore, in Pakistan, the role played by textbooks in the academic world to disseminate academic knowledge is undeniable. Furthermore, textbooks are trusted reliably.

In the Pakistani context, students face a number of problems in writing in relation to academic discourse. Those problems include a lack of analytical skills and inadequate command of the English language (Khan, Majoka & Fazal, 2015). Learners mostly rely on merely grammar rules which are not enough to produce accurate stretches of academic discourse. Furthermore, students also face difficulties while reading to comprehend various types of texts.

LBs have extensively been studied in relation to spoken and written academic discourse, in various genres and registers. For instance, Biber et al. (1999) compared LBs in conversation with the LBs in academic prose. Similarly, Biber, Conrad, & Cortes, (2004) studied LBs in textbooks and classroom teaching; they compared them with the findings of their earlier (Biber et al., 1999) study. Moreover, Biber (2006) checked similarities and differences in LBs across various disciplines, genres, and registers. Further, Allan (2017) studied LBs in English as a lingua franca in relation to English self-study textbooks. In addition, Yousaf and Shehzad (2018) studied LBs in Ph.D thesis across various disciplines. They found noticeable variations in LBs across disciplines.

In the Pakistani context, there is little research produced on LBs which address the lexical bundles in Ph.D dissertations across different disciplines. As LBs are the significant units in academic discourse, they are also known as markers of proficiency. In Pakistan, learners at higher secondary school level are not well aware of the use of LBs because they are neither taught nor they are part of their course. Students especially science students are not proficient enough to understand different types of texts. They face problems in comprehending and understanding various phenomena in science textbooks such as interpreting diagrams, tables, figures and various procedures stated in textbooks. Therefore, the present study aimed to investigate four-word common lexical bundles which are preposition phrase expressions in relation to their frequencies and functions, in Pakistani textbooks used at the higher secondary

school level. This study highlights common preposition phrase expressions or lexical bundles in relation to their discourse functions.

## **2. Literature Review**

### **2.1. Corpora in English Language Teaching**

Corpora can be effectively used in Computer Assisted Language Learning (CALL). Learners are introduced with the effective teaching materials for practicing a language, from the real instances of a language. In most of the textbooks, the text presented as a resource material is not very effective because it is based on intuitions of textbooks' authors or teachers, and the chunks of a language are not contextualized. Learners learn effectively when real life linguistic examples are taught. Corpora offer learners genuine examples of a language use from real instances (O'Keeffe et al., 2007). In addition, through the use of corpora, the gap between inside and outside classrooms can be minimized if textbooks and material designers are informed via corpora oriented studies to revise textbooks accordingly. Moreover, with the help of corpora, effective teaching materials for English language teaching can be designed such as teaching guides, course books such as Touchstone Series (McCarthy, McCarten & Sandiford, 2005), vocabulary books, list of common phrases, grammar books and many more. Learners can get corpus-based materials for learning a language such as handouts that include various tasks and activities (Johns, 2002). These kinds of activities are known as data-driven learning (DDL) which are available in both print and online (Johns, 2002).

### **2.2. Corpora in English for Academic Purposes**

Corpora play a vital role in the field of English for Academic Purposes/English for Special Academic Purposes (EAP/ESAP). For analysts, the advent and the use of corpora have made it possible and easy to examine language patterns, most frequent words, and frequent phrases in various domains. Moreover, it is easy to have thorough insights into a particular genre in order to explore its characteristics. The use of corpora in EAP is also known as an evidence-based approach to particular genres to know what is typical in them. In the field of EAP, this approach is employed to determine certain linguistic features for a particular kind of discourse. As for as designing material is concerned, good corpus-informed dictionaries (Major, 2006; Rundell, 2007) corpus-informed textbooks (Huntley, 2006; Swales & Feak, 2004) are produced through employing corpora.

### **2.3. Previous Studies on Lexical Bundles**

Previous research studies on LBs generally agree on the pedagogical value of LBs, many studies, not just focusing on the theoretical status/aspects of lexical bundles but also give particular suggestions for teachings. Pedagogically, the importance of LBs cannot be denied especially in academic discourse. Similarly, Simpson-Vlach and Ellis (2010) suggested academic formulas list for EAP curricula, Cortes (2004) and Hyland (2008a) concluded their research studies with pedagogical implications with the aim that the inclusion of LBs in learners' reading and writing can improve their awareness about them to perform well in reading and writing. Further, Cortes (2006), after conducting an experimental research on LBs, suggested that there is a need to include better and longer exposure to LBs in disciplinary writing courses. In addition, Neely and Cortes (2009) focused on the utilization of a set of LBs in academic lectures.

Moreover, Byrd and Coxhead (2010) established the list of twenty-one 4-word LBs utilized in science, arts, commerce, and law, for pedagogical implications.

Further, a research study on LBs was conducted by Taghi, Afghari, and Koosha (2012), in which they generated a list of LBs used in physics articles. Another research study carried out by Kashiha and Heng (2014) on LBs suggested that LBs explicit teaching would help students to acquire a language, these studies also emphasized the pedagogical values of LBs.

Moreover, Durrant (2017) conducted a research study on LBs in relation to disciplinary variations in university student writing. For compiling a corpus, the included disciplines such as science/technology, humanities/social sciences, life sciences, and commerce. Notable variations were found across these disciplines. Furthermore, variations within the disciplines among writers were also been found. It had also been found that most of the disciplines are relatively internally homogenous.

In conclusion, all the studies which have been discussed above shed light on the pedagogical importance of lexical bundles in academic discourses, as LBs are the building blocks of academic discourse. The research studies cited above motivated our investigation of LBs with the view of creating a list of bundles that can be utilized while making decisions for EAP/ESAP pedagogy. In the Pakistani context, there is very little research produced on LBs where LBs in Ph.D theses have been studied. No research study has addressed LBs occurring in Pakistani textbooks.

The present study seeks to investigate lexical bundles which are preposition based, in Pakistani textbooks of physics and chemistry used in Khyber Pakhtunkhwa at an intermediate level in order to know the functional taxonomies of LBs used in these textbooks. The present study has the following questions:

1. How many four-word common core lexical bundles (preposition phrase expressions) do occur in Pakistani higher secondary school level textbooks of physics and chemistry?
2. What are the discourse functions of those four-word common core lexical bundles (preposition phrase expressions) occurring in Pakistani higher secondary school level textbooks of physics and chemistry?

### **3. Research Methodology**

Corpus Linguistics is branch of linguistics that describes methodology for data analysis (Zahra & Abbas, 2018). In this research study, the methodological framework has been taken from Corpus Linguistics to study preposition phrase expressions: lexical bundles with their functions in Pakistani textbooks. Moreover, mixed-method approach: both quantitative and qualitative has been employed in this research study. A quantitative analysis was performed to explore the number and frequencies of lexical bundles. In addition, a qualitative analysis was carried out to explore the discourse functions of the respective lexical bundles.

### 3.1. Theoretical Framework

In this research study, the functional taxonomies of lexical bundles devised by Biber et al. (2004) were used as the theoretical basis. Biber et al. (2004) investigated lexical bundles in university teaching and textbooks. The functional taxonomies used in Biber et al. (2004) for the classification of functional categories of lexical bundles were adopted from Biber, Conrad, & Cortes, (2003) in which functional types of lexical bundles developed for conversation and academic prose were discussed.

For this research study, the functional taxonomies used in Biber et al. (2004) seemed the most suitable as in many research studies, focusing on lexical bundles, this framework has been used and found reliable (see, for example, Allan, 2016; Biber & Barbieri, 2007; Hyland, 2008a; Kashiha & Chan, 2015; Simpson-Vlach & Ellis, 2010; Tomankova, 2016). The present study, therefore, adopted the functional taxonomies from Biber et al. (2004) and these taxonomies (functional categories) have been modified due to the new functional categories explored in textbooks.

In Biber et al. (2004), in functional categories of lexical bundles, there are three main functional categories of lexical bundles: stance expressions, referential expressions, and discourse organizers. Besides these functional categories of lexical bundles, special conversational functions groups have also been devised. Referential bundles “make direct reference to physical or abstract entities or to the textual context itself” (Biber et al., 2004, p. 384). Furthermore, “stance bundles express attitudes or assessments of certainty that frame some other proposition” (Biber et al., 2004, p. 384). Lastly, discourse bundles, according to Biber et al. (2004), negotiate and arrange the flow of discourse by providing links to previous and coming sections. Including subcategories of lexical bundles, Table 1 presents the functional taxonomies of lexical bundles used in Biber et al. (2004).

Table 1: Functional taxonomies of lexical bundles used in Biber et al. (2004, p.384).

Functional categories of lexical bundles	Examples
1. Stance Expressions	
<ul style="list-style-type: none"> <li>• Epistemic stance               <ul style="list-style-type: none"> <li>➤ Personal</li> <li>➤ Impersonal</li> </ul> </li> <li>• Modality/attitudinal stance               <ul style="list-style-type: none"> <li>➤ Desire                   <ul style="list-style-type: none"> <li>▪ Personal</li> </ul> </li> <li>➤ Obligation/directive                   <ul style="list-style-type: none"> <li>▪ Personal</li> <li>▪ Impersonal</li> </ul> </li> <li>➤ Intention/prediction                   <ul style="list-style-type: none"> <li>▪ Personal</li> <li>▪ Impersonal</li> </ul> </li> <li>➤ Ability                   <ul style="list-style-type: none"> <li>▪ Personal</li> <li>▪ Impersonal</li> </ul> </li> </ul> </li> </ul>	<p><i>I don't know if, I think it was are more likely to, the fact that the</i></p> <p><i>I don't want to, what do you want</i></p> <p><i>you need to know, I want you to it is necessary to, it is important to</i></p> <p><i>I am going to, are we going to it's going to be, are going to be</i></p> <p><i>to come up with, to be able to it is possible to, can be used to</i></p>
2. Discourse Organizers	
<ul style="list-style-type: none"> <li>• Topic introduction/focus</li> <li>• Topic elaboration/clarification</li> </ul>	<p><i>take a look at, what to do is</i></p> <p><i>on the other hand, nothing to do with</i></p>

3. Referential Expressions	
• Identification/focus	<i>is one of the, one of the most</i>
• Imprecision	<i>and stuff like that, or something like that</i>
• Specification of attributes	
➤ Quantity specification	<i>have a lot of, in a lot of</i>
➤ Tangible framing attributes	<i>in the form of, the size of the</i>
➤ Intangible framing attributes	<i>in terms of the, in the case of</i>
• Time/place/text reference	
➤ Place reference	<i>in the united states, of the united states</i>
➤ Time reference	<i>at the same time, at the time of</i>
➤ Text deixis	<i>as shown in the figure, shown in figure N</i>
➤ Multi-functional reference	<i>at the end of, the top of the</i>
4. Special Conversational Functions	
• Politeness	<i>thank you very much</i>
• Simple inquiry	<i>what are you doing</i>
• Reporting	<i>I said to him/her</i>

### 3.2. Data

Higher secondary school certificate (HSSC) level textbooks (four textbooks) were selected for this research. In higher secondary school level textbooks, physics and chemistry textbooks (physics part I and II, and chemistry part I and II) were selected. The selected textbooks have been published by Khyber Pakhtunkhwa textbook board. Although several textbook boards are operational in Pakistan, the textbooks of Khyber Pakhtunkhwa textbook board were selected.

### 3.3. Corpus Design, Size, Compilation and Extraction of Lexical Bundles

For corpus compilation, the selected textbooks were scanned to make them digitized. The corpus compiled for this study consists of four text-files: physics part one, physics part two, chemistry part one, and chemistry part two. After scanning the books, Free-OCR software (version 5.41) was used, it is Optimal Character Recognition software freely available on the internet; scanned pages were passed through OCR software in order to get a digital/editable version of them. The digital form of the text was copied from OCR and was pasted in Microsoft office MS Word 2007. Files were passed through Text-fixer software to clean the data by removing unnecessary spaces like line spaces and paragraph spaces. This software is freely available online (<https://www.textfixer.com>). Once the data was collected and cleaned through the respective procedure, Microsoft word files were converted into text files through a free online file converter (<https://www.online-convert.com>). When the files were converted into text-files, they were loaded in AntConc version 3.5.2 software for the extraction of lexical bundles from the text-files for analysis. AntConc software was used for extraction of LBs. In this software, the Clusters/N-Gram option was used to get the list of lexical bundles. Therefore, cluster minimum, as well as maximum size, was set on 4. In addition, the minimum frequency was set on 4 and the minimum range was also set on 4. In the achieved list, LBs are common across the textbooks means occurring in all the selected textbooks. The following figure shows one such lexical bundle and how these LBs are common across the textbooks.

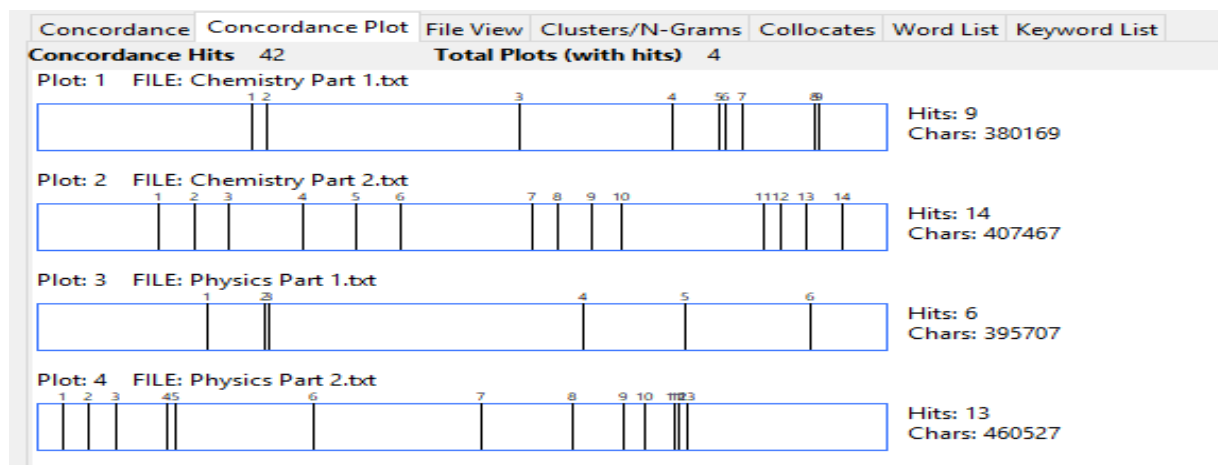


Figure 1: A screenshot of concordance plot of LB: *on the other hand*

### 3.4. Composition of the Corpus

For this research study, specialized corpora named Pakistani Corpus of Textbooks (PCT) was built in order to achieve specific research objectives and to answer particular research questions. The overall size of the corpus was 275981 words. This corpus consists of four text file: phy I (68567 words), phy II (78418 words), che I (63798 words) and che II (65198 words). Details of the words in the corpus and of these text-files have been presented in the following table.

Table 2: Composition of the corpus: Pakistani Corpus of Textbooks

Register/Textbooks	No. of texts	No. of words
Physics Part One	1	68567
Physics Part Two	1	78418
Chemistry Part One	1	63798
Chemistry Part Two	1	65198
<b>Total</b>	<b>4</b>	<b>275981</b>

## 4. Data Analysis

After generating the list of LBs by AntConc 3.5.2, manual filtration was carried out; a few lexical bundles have been excluded because they have no distinctive or clear functions. Rest of the bundles have been analyzed functionally. The study found 20 common four-word preposition phrase expressions or lexical bundles used in the selected textbooks. All the bundles with their frequencies and functions are shown in the following tables.

Table 3: Lexical bundles with their frequencies

Lexical Bundle	Frequency	Lexical Bundle	Frequency
at the end of	14	in the case of	13
at the same time	19	as a result the	10
in contact with the	05	as a result of	28
in other words the	09	to the fact that	06
in such a way	20	on the surface of	16

in terms of the	07	on the other hand	42
in the absence of	17	on the nature of	13
with the increase of	05	in this chapter we	08
with respect to the	10	in this case the	09
as that of the	07	in the form of	49

Table 4 Lexical bundles with their discourse functions

Lexical Bundle	Discourse Function	Lexical Bundle	Discourse Function
at the end of	Referential Expression: Multi-functions: Time/Place/text reference	in the case of	Referential Expression: Intangible framing attributes
at the same time	Referential Expression: Time reference	as a result the	Discourse Organizer: Cause and effect
in contact with the	Referential Expression: Intangible framing attributes	as a result of	Discourse Organizer: Cause and effect
in other words the	Discourse Organizer: topic clarification/elaboration	to the fact that	Referential Expression: Intangible framing attributes
in such a way	Referential Expression: Intangible framing attributes	on the surface of	Referential Expression: Place reference
in terms of the	Referential Expression: Intangible framing attributes	on the other hand	discourse Organizer: topic clarification/elaboration
in the absence of	Referential Expression: Intangible framing attributes	on the nature of	Referential Expression: Intangible framing attributes
with the increase of	Referential Expression: Intangible framing attributes	in this chapter we	Discourse Organizer: topic introduction/focus
with respect to the	Discourse Organizer: topic introduction/focus	in this case the	Referential Expression: Intangible framing attributes
as that of the	Discourse Organizer: comparison	in the form of	Referential Expression: Tangible framing attributes

In Biber et al. (2004), there are four functional categories of LBs: stance expressions, discourse organizers, referential expressions and special conversational functions. As this research study investigated LBs in textbooks, a thorough functional analysis of LBs revealed that there are no special conversational functions. Furthermore, discourse organizers and referential expressions predominate in these textbooks. In discourse organizers' functions topic introduction/focus such as *the study of the*, *in this chapter we*, and topic elaboration/clarification functions such as *is known as the*, *this process is called* etc were found. On the other hand, the findings of the study contributed some functions into the discourse organizers' functional category.



The study did not find any differences in the use of LBs (functions) across the textbooks. The reason might be that physics and chemistry are interrelated science subjects. Each lexical bundle has been used for a similar function across the textbooks.

In addition, the findings do not make any further functional contribution to Biber et al. (2004) functional taxonomies. All referential expressions in Biber et al.'s (2004) such as identification/focus, specification of attributes, and time/place/text reference are present in the textbooks except *Imprecision*.

It is important to state some of the examples of the discourse functions of lexical bundles. The following examples of each functional category have been taken from the textbooks.

#### 4.1. Discourse Organizers

In discourse organizers, *topic introduction/focus* function such as *with respect to the* appeared in these textbooks. Examples include, the wire is maintained at a high positive potential (about 1000V) *with respect to the* tube. (Physics) The 1:6 mole ratio *with respect to the* amounts of Cr<sup>207</sup>2 and Fe<sup>2+</sup> is consumed. (Chemistry)

1	chloride and potassium iodide in solution. The reaction is first order <b>with respect to the</b> concentration of FeCU and second order with respect to the c	Chemistry P.
2	t order with respect to the concentration of FeCU and second order <b>with respect to the</b> concentration of KI i.e. if the concentration of FeCb is doubled	Chemistry P.
3	times when the concentration doubles, the reaction is second order <b>with respect to the</b> reactant. For a reaction involving more than one reactants we	Chemistry P.
4	molecular form of the equation can be written as: The 1:6 mole ratio <b>with respect to the</b> amounts of Cr <sup>207</sup> 2 and Fe <sup>2+</sup> is consumed. Manganese, symb	Chemistry P.
5	on whether the second group occupies ortho, meta or para position <b>with respect to the</b> first (already attached) group. Effect of a substituent already p	Chemistry P.
6	dy which is projected with speed $v_0$ , at an angle $0 < \theta < 90^\circ$ , <b>with respect to the</b> horizontal, as shown in fig 3.20(b). The path of the projectile is:	Physics Part
7	brick. Thus P.E is defined as: Energy in a body is due to its position ( <b>with respect to the</b> surface of earth) If 'm' is mass, g is acceleration due to gravity	Physics Part
8	The electric flux $\phi$ depends upon the orientation of surface area A <b>with respect to the</b> field lines Flux at any angle When the area A IS tilted such tha	Physics Part
9	eriod when measured by an observer moving with a speed of 0.95c <b>with respect to the</b> pendulum? An electron, which has a mass $9.11 \times 10^{-31}$ kg, mo	Physics Part
10	e. The wire is maintained at a high positive potential (about 1000V) <b>with respect to the</b> tube. When a high energy particle or photon enters the tube t	Physics Part

Figure 2: A screenshot of LB *with respect to the*

Moreover, in discourse organizers, *topic elaboration/clarification* functions such as *on the other hand* are there in textbooks. Examples are: *These on one hand, are essential for human body, but on the other hand, if their concentrations are greater than about 500 ppm, they make water unfit for drinking, and such water is considered to be polluted* (Chemistry). *The total Kinetic energy, on the other hand, is generally not conserved in a collision because some of the Kinetic energy is converted into internal energy* (Physics).

14	observed that halogens, though ortho/para directing, are ring deactivators. On the other hand, the meta-directing groups withdraw electrons from the	Chemistry P.
15	produces alkene as the major product because ethoxide is a strong base. On the other hand the same 2-bromopropane on reaction with an anion of	Chemistry P.
16	carbonyl compounds (aldehydes and ketones) on one hand and alcohols on the other hand. Although the carboxylic group contain the carbonyl group	Chemistry P.
17	molecular formula C <sub>5</sub> H <sub>10</sub> O <sub>4</sub> cannot be represented by C <sub>n</sub> (H <sub>2</sub> O) <sub>n</sub> formula. On the other hand, there are also some compounds which follow this C <sub>n</sub> (H	Chemistry P.
18	re the enzymes undergo denaturation and their activity decreases rapidly. On the other hand, decreasing the temperature, the activity of the enzyme i	Chemistry P.
19	e and thymine while the pyrimidine bases of RNA are cytosine and uracil. On the other hand both DNA and RNA contain the same types of purine ba	Chemistry P.
20	serious threat to the human life as it contaminates the drinking water and on the other hand is a pressing problem for plants, animals aquatic life and	Chemistry P.
21	er are mostly salts. These on one hand, are essential for human body, but on the other hand, if their concentrations are greater than about 500 ppm,	Chemistry P.
22	of acidic and basic radicals in a salt involves qualitative chemical analysis. On the other hand, volumetric analysis (titrations) and gravimetric analysis	Chemistry P.
23	anging from violet to red. The emission spectra of atoms in the gas phase on the other hand, do not show a continuous spread of wavelength from re	Chemistry P.
24	s long as the system may be considered isolated. The total kinetic energy, on the other hand, is generally not conserved in a collision because some c	Physics Part
25	has the ability of exerting force on another body and of doing work on it. On the other hand whenever we do work on a body, we store in it an amou	Physics Part
26	machine due to friction or any other means that can waste useful energy. On the other hand, the efficiency of an automobile is only around 15%. Abx	Physics Part
27	al to half X a wavelength ( $\lambda/2$ ) between the incident and reflected pulses. On the other hand if the fixed end of the string is attached to a ring which c	Physics Part
28	ve and below central point O (bright fringe). Destructive Interference at p On the other hand if the path difference "s" between the two waves from A	Physics Part
29	rgy, in the form of molecular kinetic energy, thus raising the temperature. On the other hand, when the gas is heated at constant pressure, the gas wil	Physics Part
30	n Figure 11.8 a). Aluminum is an- excellent electrical conductor. Selenium, on the other hand, is a photoconductor; it is an insulator in the dark but bei	Physics Part
31	om plate A to plate B and acquire kinetic energy as shown in Fig: 11.23(a). On the other hand external force is required to move the charge against el	Physics Part
32	nd with Sodium ion is positive while the end with Chlorine ion is negative. On the other hand, a non-polar molecule like oil has no electric dipole mom	Physics Part
33	r small. Therefore, these materials are good conductors of electric current. On the other hand, resistivity of insulators is extremely large. As a result, th	Physics Part

Figure 3: A screenshot of LB *on the other hand*

In addition, the *cause and effect* is also found in the textbooks such as *as a result of*. The following examples are from textbooks. A polymer is a macromolecule formed *as a result of* a process known as polymerization (Chemistry). The source of geothermal energy is *as a result of* die sun rays beating down on the land surface (Physics).

9	esium. So the electronic density is lying close to carbon than magnesium. As a result of this electronegativity difference, the carbon atom has a parti	Chemistry P.
10	rge on the oxygen atom and a partial positive charge on the carbon atom. As a result of this polarization, most carbonyl reactions involve nucleophil	Chemistry P.
11	a macromolecule (sometimes with a very high molecular weight) formed as a result of a process known as polymerization whereby small organic m	Chemistry P.
12	um and used in the chemical trade. A polymer is a macromolecule formed as a result of a process known as polymerization. Addition polymer are lor	Chemistry P.
13	in the presence of water or water vapours, droplets of H <sub>2</sub> SO <sub>4</sub> are formed as a result of this reaction. H <sub>2</sub> SO <sub>4</sub> is corrosive to such diverse materials as	Chemistry P.
14	entists believe that the earth maintains its long-term average temperature as a result of a balance between the heat received from the sun and the he	Chemistry P.
15	rms of beneficial bacteria, which are essential to aquatic life, are also killed as a result of acidity in water. Plant growth is seriously inhibited due to aci	Chemistry P.
16	c. The dissolved organic compounds, acting as impurities, enter into water as a result of the growth and the death of aquatic plants, such as algae. Otl	Chemistry P.
17	pectrophotometry is a technique used to identify the different substances as a result of their interactions with the electromagnetic radiations, spectr	Chemistry P.
18	, come from the electron gun collide with the sample atoms or molecules. As a result of these collisions electrons from the sample atoms or molecu	Chemistry P.
19	energy schemes. 4. Geothermal Energy The source of geothermal energy is as a result of die sun rays beating down on the land surface. We shall now	Physics Part
20	turbance of some kind moving from the source to the surrounding places as a result of which energy is transmitted from one point to another point.	Physics Part
21	tance and its surroundings or between one part of a substance to another as a result of temperature difference only. Heat is energy in transit. It flows	Physics Part
22	e left plates of the capacitor C and -Q charge is induced on its right plates. As a result of this charging each capacitor gets an equal amount of charge	Physics Part
23	. The electrons experience a force in a direction opposite to electric field, E. As a result of this force and the continuous collision with the atoms, the el	Physics Part
24	show the direction of eddy current and the polarity produced in the sheet as a result of magnetic field. How electromagnetic brake works? Explain. A	Physics Part
25	ied voltage as shown in fig 15.11(b).The alternating voltage is be given by As a result of this voltage, an alternating current / will flow in the circuit. TI	Physics Part
26	absorption is atmospheric ozone, which has been depleted in recent years as a result of chemical reactions with fluorocarbons released from aerosol	Physics Part
27	ments under investigation, in vapour form, are ionized in the ion source S. As a result of ionization, one electron is removed from the particles, leavin	Physics Part
28	ells is the basic unit of life. Its normal metabolic function may be disrupted as a result of interaction with the ionizing radiation. Excessive radiation do	Physics Part

Figure 4: A screenshot of LB *as a result of*

## 4.2. Referential Expressions

### 4.2.1. Specification of attributes

In the same functional category, *Intangible framing attributes* functions are present in these textbooks such as *on the nature of* are also there in textbooks. The e/m ratio is always smaller than that for cathode rays and depends *on the nature of* gas present in the discharge tube (Chemistry).

The value of the neutral temperature is constant for a thermocouple, depends *on the nature of* materials and is independent of the temperature of the cold junction (Physics).

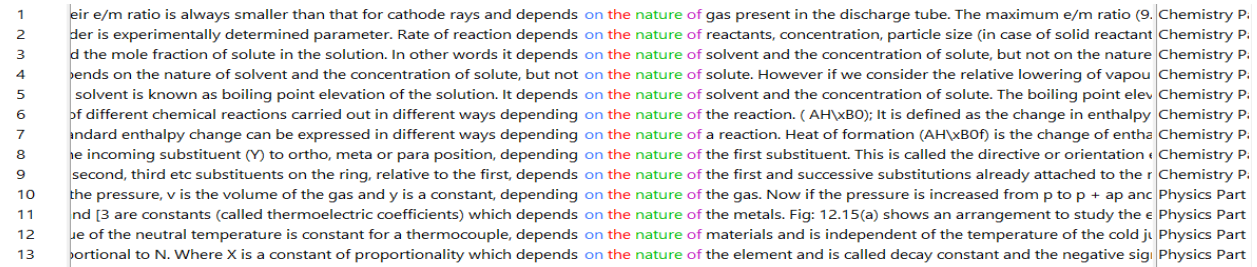


Figure 5: A screenshot of LB *on the nature of*

#### 4.2.2. Time/place/text reference

In textbooks, in referential expressions, *Place reference* such as *on the surface of* are also there, the following examples have been taken from textbooks. This also means that ice will float *on the surface of* water (Chemistry). Similarly colours are observed in the soap bubbles *on the surface of* water (Physics).

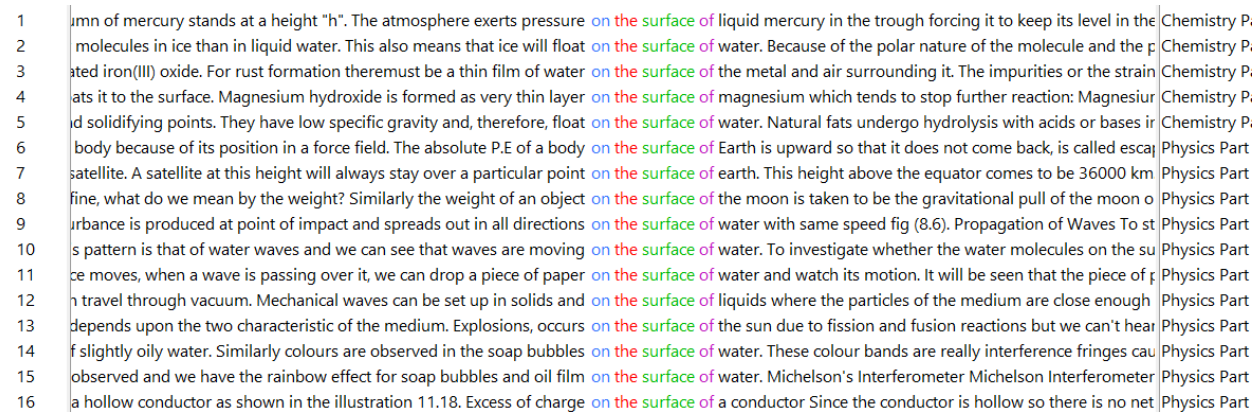


Figure 6: A screenshot of LB *on the surface of*

We also found referential expressions or *time reference functions* such as *at the same time* in these textbooks. Here are some examples from textbooks. *A system may lose energy to the surroundings in the form of heat but at the same time the same amount of energy is absorbed by the surroundings* (Chemistry). *If the whole heart muscle contracted at the same time, there would be no pumping effect* (Physics).

1	there were some other rays (streams of faint luminous glow), produced at the same time, moving towards cathode. These rays passed through the ce	Chemistry P
2	. A system may lose energy to the surroundings in the form of heat but at the same time the same amount of energy is absorbed by the surrounding	Chemistry P
3	e attacked by the OH radicals and thereby destroyed in the troposphere. At the same time the Cl and/or F substituent's lend these chemicals some of	Chemistry P
4	ned as - When two or more waves are passing through the same region at the same time, the total displacement at the point where they interact, is e	Physics Part
5	e. Interference is of two types. When two waves arrive at the same place at the same time in phase then they reinforce each other and constructive int	Physics Part
6	the other. Destructive Interference If two waves arrive at the same place at the same time but are out of phase (180°), then destructive interferenc	Physics Part
7	two waves must be phase coherent. They must arrive at the same place at the same time The two waves must be traveling in the same direction. The	Physics Part
8	nce of sound waves. When two coherent waves arrive at the same place at the same time, they reinforce each other and interference takes place. Acti	Physics Part
9	y when two sound sources of slightly difference frequency are sounded at the same time, we will hear a single note which rises and falls in intensity.	Physics Part
10	ction. When a compression from A and rarefaction from B reach the ear at the same time, they will cancel each other and no sound is heard. After t5	Physics Part
11	These wave crests together with the source itself, passing a given point at the same time. All the energy of the sound waves is compressed into a ver	Physics Part
12	0.1 In a certain process, 400 J of heat energy is supplied to a system and at the same time 150 J of work is done by the system. What is the increase in	Physics Part
13	fig.( 10.9). When the gas is heated in this way its temperature rises and at the same time it expands by pushing the piston upward against the consta	Physics Part
14	eat of water is 4180 J mole <sup>-1</sup> K <sup>-1</sup> . A system absorbs 1176 J of heat and at the same time does 352.8 J of external work. Find the change in internal en	Physics Part
15	. An object moving under the action of gravity and moving horizontally at the same time. Error due to fluctuations in the measured quantity. The hor	Physics Part
16	d makes the heart muscle contract. If the whole heart muscle contracted at the same time, there would be no pumping effect. Therefore the electric ac	Physics Part
17	sor representation enables us to quickly obtain the numerical value and at the same time as the events taking place in the circuit. The applied voltage	Physics Part
18	travels forwards and backwards with equal speed and reach both doors at the same time. The doors then open, and the train traveler sees them open	Physics Part
19	s disintegration of a radioactive material not all the atoms disintegrates at the same time. Contrary, different atoms decay at different times. The proc	Physics Part

Figure 7: A screenshot of LB *at the same time*

In referential expressions, *text deixis* functions such as *at the end of* are also found in textbooks. Examples from textbooks include: choose the suitable answer from the following choices given *at the end of* the question (Chemistry).

In referential expressions, *multi-functional reference* is also there such as *at the end of*. Here are examples from textbooks. *Choose the suitable answer from the following choices given at the end of the question* (Chemistry). *Both theories, Discovered at the end of 19th century* (Physics). *A mass at the end of spring describes S.H.M with T= 0.40s* (Physics). Moreover, Figure 8 presents some of the occurrences of this respective functions.

1	s units. In this case an extra step is added (either at the beginning or at the end of the procedure) that we have just learned. It is important to recogniz	Chemistry P
2	ometric amounts are reacted together, there will be no reactants left at the end of the reaction. In actual practice, however, due to one reason or the ot	Chemistry P
3	consumed in the reaction and are recovered chemically unchanged at the end of the reaction. Very small amount of catalyst is needed for speeding u	Chemistry P
4	nisms. Choose the suitable answer from the following choices given at the end of the question. Activated complex is a substance which is A reaction is	Chemistry P
5	e common at the beginning of series and +2 state is more common at the end of series as shown in table 14.3. The highest oxidation state from Sc+3	Chemistry P
6	ze ethane to ethyl alcohol. Select the most appropriate choice given at the end of each question? The Transition metals Copper and are best electrical	Chemistry P
7	alkenes in electrophilic reactions. Alkynes in which the triple bond is at the end of the chain, are referred to as terminal or 1 - alkynes. Terminal alkynes	Chemistry P
8	one body. Centrifugal force or Reaction Force When we whirl a ball at the end of a string, we transmit this force to the ball by means of string, pulling	Physics Part
9	an position, If spring constant of spring is 0.4 N m <sup>-1</sup> and its velocity at the end of this displacement be 0.4 m s <sup>-1</sup> . Calculate (i) Time period 'T' (ii) Freque	Physics Part
10	one of the halves, the frequency is '72' Find out fxf2-I. A mass at the end of spring describes S.H.M with T = 0.40 s. Find out a when the displac	Physics Part
11	nd the amplitude, frequency and time period of an object oscillating at the end of a spring, if the equation for its position at any instant t is given by x	Physics Part
12	source covers distance V after 1 second and reaches the listener "L". At the end of one second the source covers distance "a" where it gives the last w	Physics Part
13	theory of relativity and the quantum theory. Both theories, Discovered at the end of 19th century, revolutionized physics in A GPS satellite is a satellite u	Physics Part
14	e is about 10 <sup>-8</sup> s. What is its uncertainty in energy during this time? At the end of this chapter the student will be able to: describe and explain the ori	Physics Part

Figure 8: A screen shot of LB *at the end of*

## 5. Conclusion

This research study aimed at answering two research questions about numbers and frequencies of common lexical bundles with their discourse functions across the respective textbooks. The present corpus-based research study has generated a list of 20 four-word common LBs found across the selected textbooks. All the LBs have been analyzed functionally. Furthermore, examples have been stated from the textbooks in order to state the discourse functions of these common LBs across the textbooks. The list of LBs with their functions



provided by this study has great potential to inform EAP research and practice. According to a general point of view, the list provided by this study can be used to enhance learners' writing skills and reading comprehension skills. In fact, some previous research studies such as Cortes (2006), Jones and Haywood (2004), and Byrd and Coxhead (2010) strongly recommend the utility of LBs as the basis for material design and curriculum development. These common LBs occur in Pakistani textbooks and are thus corpus-informed. They include a list of LBs materials/results. Therefore, corpus-informed materials (such as the list provided by this study) can be more effective if used for pedagogical purposes. This list of four-word common LBs can be beneficial for designing materials (various tasks and activities for enhancing reading and writing can be designed) which can be more effective for writing in general and writing for academic purposes. For instance, Cortes (2006) did an experimental study in order to measure the effectiveness of the application of LBs in language teaching (LT). The findings revealed that there was an increase in learners' awareness of and interest in LBs. If Pakistani students were introduced the list of common LBs occurring in textbooks, their academic discourse could be further improved and statistically measured. Furthermore, Jones and Haywood (2004) also gauged the effectiveness of teaching and learning LBs, and their results showed that LBs are highly effective in improving students' academic discourse. They agreed on the pedagogical significance of the lexical bundles. In this way, the LBs occurring in textbooks can be fruitfully significant for Pakistani students to enhance their reading comprehension and writing for academic purposes.

If Pakistani learners are pedagogically exposed to this list of common LBs (LBs with functions and examples) their academic writing skills will improve. Learners will be able to know about using a particular LB for a particular function. On the other hand, list of common LBs will also contribute to learners' competence in reading comprehension. In this way, this list can be beneficial for learners to enhance their awareness about the LBs and about the use of LBs as LBs constitute an important part of academic writing.

The list of common core four-word lexical bundle (those LBs which are common across the textbooks) can be crucially important to play a vital role in designing a syllabus for higher secondary school level. This list will enhance learners' ability to read (in terms of comprehension) and write (writing in general and academic writing) well. Moreover, these LBs can enrich the creative writing of the learners. If students are pedagogically exposed to this list of LBs, it will not just improve their reading and writing, but also their speaking (establishing coherence in what they say) and listening (comprehending what they listen).

By utilizing the list of LBs provided by this study, various types of tests can be designed to check the students' level of proficiency in English language skills. Furthermore, supplementary materials can also be designed by using the list of LBs provided by this study for learners to practice different tasks and activities in terms of reading and writing.

Moreover, if students are taught these common LBs occurring in textbooks, their listening comprehension and coherence in speaking can be significantly enhanced because LBs effectively contribute to all four language skills. Furthermore, LBs can be taught at the phrasal level: phrases/chunks to the students. Commonly, students are taught vocabulary (wordlist) or they are introduced with the list of vocabulary. If they are taught LBs/lexical phrases/phrases, their all four language skills can be effectively enhanced. As a result, students will be able to

comprehend well what they read and they will be able to accurately produce the desired academic discourse. In the Pakistani context, students face many problems (such as an inadequate command of English language and analytical skills) in writing in relation to academic discourse (Khan, Majoka & Fazal, 2015). The academic discourse of Pakistani students needs further improvement. If Pakistani learners are introduced to the list of LBs provided by this research, their academic discourse could be further improved.

For enhancing students' language skills, LBs can be made part of different tasks and activities in order to give effective exposure of the understanding and the utility of LBs in academic discourse. Various writing and reading tasks/activities can be designed such as identifying functions of LBs, using LBs according to the requirements of the discourse, and making use of LBs in statements. Students can be asked to write paragraphs on topics by providing them a list of LBs to be used according to their functions. Instructions on the identification and the utility of LBs can effectively enhance students' English language skills such as reading and writing.

In addition, the list provided by this corpus-based research study can be useful for students in various academic writing tasks. As academic writing is a complex task; students need to master it to do well in academic discourse, the same point has been highlighted by Biber (2006), and, Swales and Feak (2004). The utilization of LBs helps learners to produce accurate stretches of discourse (Millar, 2011). Learners can also generate more stretches of LBs such as *with the increase of*, *with the decrease of*.

Another significant application of the present study is that the list of common LBs obtained can be used in EAP curriculum design. The developers of the curriculum should integrate LBs that are recurrent expressions and building blocks of academic discourse. LBs can enhance learners' both reading and writing skills. The teaching of LBs not only helps learners to produce quick and accurate academic discourse but may also aid in improving reading comprehension and understanding various types of texts (Wray, 2002).

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