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The First Corpus-Based Persian Academic Word List: Development and Pedagogical Implications

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ABSTRACT

This article generates the first Persian Academic Word List (PAWL) which comprises the most frequently used academic vocabulary in Persian academic texts. The PAWL was compiled from a corpus of 927,008 running words from academic resources. Two principles of range and frequency of word families guided the selection and arrangement of the word list. The corpus included seven books and one hundred and twelve research articles selected from 28 journals using simple random sampling. The corpus pertained to seven disciplines including Arts and Architecture, Engineering and Technology, Agriculture and Natural resources, Medical sciences, Veterinary sciences, Humanities, and Basic sciences. The established PAWL contains 539 headwords, in books and research articles under study. The PAWL may serve as an essential frame of reference and a valuable source for Persian language learners, researchers and materials planners, particularly in developing materials when the mastery of Persian academic vocabulary and literacy is an aim.

Keywords: Persian Academic Word List, teaching Persian, academic vocabulary, frequency, range

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1. Introduction

Vocabulary acquisition has been regarded as a vital component of language learning, since the depth of students' vocabulary has a direct effect on the quality and accuracy of their writing and comprehension of materials (Coady, Hubbard, Magoto, & Mokhtari, 1993; Nation, 2001; Read, 1998). Vocabulary is also an essential element of students' university life, principally in high-stakes reading, writing and assessment (Coxhead, 2012).

Nation (2001) divides vocabulary into four categories including technical vocabulary, academic vocabulary, and low and high frequency words. This division implies that some vocabulary requires more attention in different stages of language learning. Academic vocabulary or "sub-technical or semi-technical vocabulary" for example, is viewed as "formal, context-independent words not usually found in basic general courses which have a high frequency and wide range of occurrence across scientific disciplines" (Farrell, 1990, p. 11). Knowledge of academic vocabulary supports learners in their academic studies and is regarded as a crucial element of academic reading and writing abilities, which is directly linked to academic success and economic opportunity (Goldenberg, 2008; Jacobs, 2008; Nagy & Townsend, 2012).

The importance of academic vocabulary lies in the role that it plays in the construction of scientific experience. Different authors provide different criteria for the classification of academic vocabulary; however, all consider academic vocabulary as the vocabulary that reports the experiences of science and technology. Coxhead and Nation (2001) maintain that academic words represent an extensive number of words in academic texts and most students are expected to be familiar with technical words of their academic disciplines more than the general academic vocabulary. This further highlights the importance of learning and teaching academic vocabulary. Therefore, many experts recommend explicit teaching of academic vocabulary, and focusing on core academic word lists (e.g. Bauman & Graves, 2010; Gardner, 2013; Graves, 2006; Nagy & Townsend, 2012; Nation, 2008; Zimmerman, 2009).

Academic and high frequency vocabulary have been collected into word lists. Word lists are an important element of syllabus design for foreign language learning and instruction. In educational systems, they support testers and materials writers of the type of vocabulary students will find most useful and can guide syllabus, textbook, and test contents (Campion & Elley, 1971; Ghadessy, 1979).

Scholars in the area of vocabulary have developed lists of both general and academic words. For instance, Coxhead's (AWL) Academic Word List (2000) and West's General Service List (1953), respectively, are deemed useful for vocabulary teaching, materials development and course design. As far as the Persian language is concerned, no generally acknowledged academic word list has been developed, though it is no less significant as a frame of reference for Persian learning and teaching and the parties of interest. The PAWL established in this study may serve as a useful resource for materials developers, course-book designers and researchers. It may also be used as a useful guide to assist learners in learning and using academic vocabulary in receptive and productive skills.

2. Literature Review

Many researchers have carried out studies on academic vocabulary and have developed useful academic word lists (e.g. Campion & Elley, 1971; Coxhead, 2000; Ghadessy, 1979; Lynn, 1973; Praninskas, 1972; Xue & Nation, 1984). Many of these academic word lists focused on the academic vocabulary occurring across different disciplines. A vocabulary list was developed by Campion and Elley (1971) comprising 3200 frequently-used words and 500 most common academic words by examining 301800 vocabulary items in lectures and books involving 19 academic disciplines. Praninskas (1972) also developed the American University Word List, which was based on a corpus of 272466 words from 10 university-level textbooks including 10 academic disciplines. Lynn's (1973) and Ghadessy's (1979) word lists were established by counting the words for which foreign students wrote annotations in their university textbooks and the vocabulary that the

students had found difficult during their reading. Xue and Nation (1984) synthesized the four earlier word lists (Campion & Elley's (1971), Ghadessy's (1979), Lynn's (1973), and Praninskas's (1972)) into the University Word List (UWL), consisting of about 800 words that were not in the first 2000 words of the West's General Service List (GSL) but were of high frequency and of wide range in academic texts.

More recently, Coxhead (2000) developed the AWL, using a 3.5 million corpus of running words; the texts in her corpus were selected from different academic textbooks and journals in four disciplines: law, commerce, natural sciences and arts. The AWL comprises 570 word families that account for about 10% of the words in academic texts. She used three criteria to develop the AWL:

1. Specialized occurrence: words not included in the first 2000 word families in West's GSL;
2. Range: a member of a word family had to occur 10 times or more in each of the four subject areas, and;
3. Frequency: a member of a word family had to occur 100 times or more in the corpus.

The AWL in comparison with UWL encompasses fewer word families, but yields more text coverage across disciplines and more consistent word selection criteria. Some studies have reported AWL coverage in different corpora. For example, Chen and Ge (2007) noted coverage of 10.073% in medical research papers; and Vongpumivitch et al. (2009) reported coverage of 11.17% in applied linguistics research papers corpus. However, some scholars who have conducted studies on academic vocabulary (Chen & Ge, 2007; Hyland & Tse, 2007; Nation, 1994; Paquot, 2007), who have used different corpora, have challenged the utility of the AWL in ESP courses. They argue that the list is too general, which results in exposing students to more words than they need and lack of exposure to the specific words that they require. Another problem was related to word meaning and use. Wang and Nation (2004), after examining the items in AWL, realized the existence of homographs in the list, and recognized that

the different senses of the homographs do not meet the criteria for range and frequency to be in the list. Moreover, Hyland and Tse (2007) conducted a deeper analysis and demonstrated that words behave semantically differently in various disciplines. Words in each discipline have special meanings that are meaningful to particular disciplinary community members.

Gardner and Davies (2014) also developed an Academic Vocabulary List (AVL) based on the Corpus of Contemporary American (COCA). The corpus covers nine disciplines and is drawn from academic journals, magazines and the finance sections of newspapers. This list is different from Coxhead's AWL in a number of ways. First, the AVL was created based on lemmas (headwords and their derivational and inflectional forms) rather than word families. Word families bring together word forms with different meanings and many students are unable to identify links between the related word forms (Schmitt & Zimmerman, 2002). Using word families rather than lemmas has been seen as a significant weakness (Gardner, 2008; Hyland & Tse, 2007). Second, The AVL is based on a more representative and larger corpus. The AWL has been criticized for its inclination towards specific fields and the size of its corpus on which the word list was based (Durrant, 2014; Hyland & Tse, 2007). And third, in contrast to the AWL, the AVL is not based on any pre-existing word list. Coxhead's AWL was an extension of the General Service List (West, 1953). Therefore, the AVL is regarded to be in a better position to become a suitable and standard reference for English academic words.

Besides these discipline-crossing AWLs, some researchers have focused on compiling an academic vocabulary used in a single discipline, arguing that there might be some unique features in the academic vocabulary across sub-disciplines of one discipline. As a case in point, Chen and Ge (2007) examined the distribution and frequency of Coxhead's AWL word families in medical research articles and found that the AWL words comprised 10.07% of the vocabulary in their medical corpus including 190425 running words. In addition, it represented around 10% of the

academic vocabulary in five sections of medical research articles, namely, the abstract, introduction, materials and methods, results, and discussion sections.

As an example of single-discipline academic word list, Mudraya (2006) developed a word list containing 1200 word families for students of engineering from the Student Engineering English Corpus, comprising 2000000 running words selected from engineering textbooks in 13 engineering sub-disciplines. The words listed are frequently found in engineering textbooks necessary for all engineering students, irrespective of their fields of specialization. Moreover, a new list for academic settings called the "Billurogˇlu–Neufeld List" (Hanciogˇlu, Neufeld & Eldridge, 2008; Neufeld & Billurogˇlu 2005) was established incorporating a combination of different vocabulary lists including the AWL and GSL word families, vocabulary of the Brown Corpus, Bauman's revision of the GSL, The Longman Defining and Wordwise vocabulary (Hanciogˇlu et al., 2008). In a study carried out by Wang, Liang and Ge (2008), a medical academic word list with 623 word families was compiled from a corpus of 1093011 words in medical research articles. Furthermore, Martınez, Beck and Panza (2009) developed an academic word list in a corpus of research papers of agriculture. They provided a highly restricted word list of 92 families from the AWL. Their observations showed that some words from the AWL had scientific meaning in their corpus. Ward (2009) also developed a word list including 299 word families from an engineering corpus of 250,000 running words. The corpus was derived from engineering books on topics like statistics, basic thermodynamics, engineering materials, and fluid dynamics by having a frequency cutoff of 5 in each of the sub-disciplines. Li and Qian (2010) profiled the existence of the AWL in a financial corpus and found that the AWL had a coverage of 10.46% in the corpus.

2.1. Objective of the Study

To the best of researchers' knowledge, there have been no studies on Persian academic words in the literature. No general and commonly accepted academic word list has yet been developed for the Persian language. Therefore, this study has been motivated to create an academic word list, as a

basis for a Persian lexical syllabus, which is helpful in terms of frequency and text coverage for non-native Persian language learners. Thus, this paper attemts to answer the following research question:

What are the most frequent academic words in PAWL?

3. Method

3.1. Corpus Establishment

The researchers established an electronic corpus containing 927,008 running words from 112 research articles as the database for the study. The research articles were drawn from seven disciplines including arts and architecture, engineering and technology, agriculture and natural resources, medical sciences, veterinary sciences, humanities and basic sciences taken from among 28 journals (see Appendix B) along with one book from each discipline. All the academic texts in the corpus ranged from 2012 to 2015 and were published in Iran.

3.2. Data Collection

All research articles included in the corpus were downloaded from the Scientific Information Database (SID) the most comprehensive and up-to-date data bank in Iran which includes the latest research-scientific journals in Iran (see http://www.SID.com). SID contains the most recent Iranian scientific and research journals comprising different disciplines categorized into Agriculture and Natural Resources, Arts and Architecture, Basic Sciences, Engineering and Technology, Humanities, Medical Sciences, Veterinary Sciences and Scientific Journals. Four journals from each discipline and five articles from each journal were selected (n=112) using simple random sampling. A book from each of the fields (7 in total) was also downloaded from Iran's virtual library online (see http://www.irpdf.com). When the electronic version of articles and books were collected, their reference lists, appendices, and acknowledgements were excluded. All articles included in the corpus had identifiable Introduction, Method, Results,

and Discussion sections. The corpus was divided into seven sub-corpora within an average of approximately 132,000 running words. The features of the corpus are presented in Table 1.

Table 1
Composition of the Academic Corpus

Academic Disciplines	Engineering & Technology	Art & Architecture	Agriculture & Natural Resources	Medical Sciences	Veterinary Sciences	Humanities	Basic Sciences
Running Words	143.227	163.167	126.943	130.3235	102.557	155.098	105.6925

*Total number of words in the corpus - 927,008

3.3. Data Processing

For the standardization of academic articles included in the corpus, the charts, diagrams, bibliographies, reference lists, appendices, and acknowledgements were removed in order to eliminate the factors not related to lexical analysis. The PAWL was developed taking into analysis word families, defined as a headword and all inflections and derivations comprising that headword or stem (Bauer & Nation, 1993; Coxhead, 2000). The computer software would read all derivations of a word as its basic form and would count the frequency of them as one word family. For example, ارزش‌ها/ɑ rzIʃ hɑ :/ ،ارزشی/ɑ rzIʃ i:/, ارزش‌های/ɑ rzIʃ hɑ :yI/ would be counted as one word. Farsi plurals are formed regularly by addition of suffixes: ان ،ها pronounced as /ɑ :n/, /hɑ :/ respectively and words borrowed from Arabic ات/ /ɑ :t/. The plural might have irregular form depending on the root and singular form of the word. There is a complete reformulation of the word like سبب /sɑ bɑ b/ (cause), and its plural form اسباب /ɑ sbɑ :b/ (means, equipment). In Farsi, words may be written as connected or separated characters *می توانم*, or میتوانم /mi:tɑ vɑ :nɑ m/ (I can). Thereby, a single word may have different representational forms. The inflectional morphemes such as ترین/tɑ ri:n/, می/ /mi:/, تر/tɑ r/ and ها /hɑ :/ can appear either as bound or free affixes separated

with an intervening space (e.g.ارزشها، ارزش‌ها /ɑ rzIʃ hɑ :/). Farsi verbs are modified more extensively than English verbs.

Word lists generally adopt word families instead of any tokens as a word as "comprehending regularly inflected or derived members of a family does not require much more effort by learners if they know the base word and if they have control of basic word-building processes" (Coxhead, 2000, p. 218). After the standardization of the sample texts, the words in the corpus were counted by Expert Professional pdf (version 10) software.

3.4. PAWL Development

Similar to AWL development (Coxhead, 2000), two principles of range and frequency of a word family were adopted in this study. Coxhead (2000) referred to range as the word families whose members are found in at least half of the areas in the corpus. In this study, the members of a word family to be included in the PAWL had to occur in at least 3 of the 7 disciplines in the corpus. In addition, the least frequency of the members of a word family to be included in the PAWL was 20 times. Moreover, Coxhead (2000) stated that range was the first criterion to be examined and frequency the second since a word count based primarily on the frequency would be biased by topic-related words and longer texts. Accordingly, only the word families covering 3 disciplines or more were included in the PAWL.

In sum, according to the review of relevant literature, the researchers presumed that a Persian academic vocabulary list must incorporate the following features:

1. The list must cover the main academic fields and should be based on a comprehensive corpus of academic Persian;
2. The list should incorporate headwords and word families that may be useful for research and instructional purposes;
3. The corpus should encompass academic materials which represent contemporary Persian, not dated materials, in order to cover academic words users currently encounter in academic settings; and

4. The vocabulary list should be derived taking into account both range and frequency.

4. Results and Discussion

There were 927,008 running words, and 1463 pages of text in the corpus. Based on the word selection criteria, 539 words were ultimately selected and created the Persian Academic Word List (see Appendix A). In the PAWL, the most frequently used word was روش, which appeared 1262 times in all the 7 subject areas in the corpus, while the least frequently used one was قوت, which appeared only 20 times, in 3 out of the 7 fields in the corpus (the inclusion criteria). Table 2 shows the statistical results of the top 70 most frequently used word in the PAWL which occurred in all seven disciplines.

Five hundred and thirty nine base words of the word families common across various fields were included in the PAWL. Interestingly, derivative forms were sometimes more frequent than the base forms. The current researchers settled on a frequency cutoff of 20 in each discipline. Thus, no word occurring less than 20 times in the whole corpus was included. In fact, about 90% of the words in PAWL occurred by more than 30 times in this 927,008-word corpus. In the Appendix, the words in the PAWL are listed alphabetically and the words with highest occurrence are highlighted.

Table 2
Frequencies of Occurrence of the Top 70 Most Frequent Words of the PAWL

Words	Frequency	Words	Frequency	Words	Frequency
روش	1262	پاسخ	379	رقم	270
مورد	1187	دانشگاه	372	هدف	255
درصد	977	متفاوت	375	طرح	243
اثر	850	توسط	371	انتقال	239
سطح	785	رابطه	365	محاسبه	237
عامل	686	تابع	356	ارزش	237
جدول	629	جهت	341	ورود	234
مقدار	616	منبع	332	خطا	230
بخش	493	مربوط	330	مدت	222
مطالعه	493	با توجه	328	سنت	222
قابل	490	موجود	317	جمع	221
آموختن	487	عبارت	317	ارائه	220
اندازه	456	محصول	314	انحراف	218
به صورت	446	پروژه	313	افزایش	216
پژوهش	444	حالت	306	برابر	213
ارتباط	442	مشخص	303	برنامه	212
نمونه	439	دوره	300	نتیجه	208
اطلاع	420	فرض	298	خاص	203
درجه	417	آمار	298	سازمان	203
ساخت	416	مصرف	289	علم	203
مرحله	405	شامل	284	مثال	202
اطلاعات	391	معادل	272	بهره	201
توسعه	384	مشاهده	271	خارج	201
				امر	200

5. Conclusion and implications

The PAWL, based on a corpus of 927,008 running words, was compiled for the better learning and application of Persian academic words. By adopting two criteria of range and frequency of a word family, 539 academic words eventually formed the first Persian academic word list. The PAWL created in this study has been thus far the only Persian academic vocabulary list. By developing a list of the most frequently used Persian academic words, it is hoped to arouse the attention of learners and instructors to this type of vocabulary. The PAWL established in this study can serve as a

frame of reference for an academic Persian lexical syllabus. The word families in the PAWL are worth special attention in designing Persian for Academic Purposes (PAP) courses. It can also provide guidelines in curriculum preparation, principally in designing PAP course-books for learning Persian academic vocabulary and in selecting relevant teaching/learning materials. Additionally, the PAWL can help learners/instructors focus on essential Persian academic words, providing learners with more specific approach to learning academic vocabulary and enabling instructors to set their academic vocabulary teaching goals in different stages. Furthermore, an additional contribution of this study is to provide a frequency-based academic word list for students to assist them in both more efficient comprehension and more appropriate use of academic words when reading and writing academic texts or papers.

Since this research is a preliminary study on Persian academic vocabulary, limitations of the study need to be noted. First, it restricted itself to seven disciplines with a corpus of 927,008 running words, thus; the PAWL needs to be examined in larger corpora and other disciplines and genres. Second, since neither an established Persian word list nor a precise software for Persian word count was available to guide our research, the PAWL needs to be rechecked with other well-developed softwares.

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Appendix A

Academic Persian Wordlist including 539 headwords

Other words In the family	Headwords	Other words In the family	Headwords
اطلاعاتی، اطلاع، مطلع	اطلاعات	ابتدایی، ابتدای	ابتدا
	اطمینان	ابداعی، ابداع شدن، ابداع کردن	ابداع
اظهار کردن،اظهار داشتن	اظهار		ابهام
	اعتبار	متحد، متحد شدن	اتحاد
اعتقادات، اعتقادی	اعتقاد	اتخاذ شدن	اتخاذ
اعطای	اعطا	اتصالات، اتصال شدن، متصل، اتصال دهنده	اتصال
اعمال کردن، اعمال شدن	اعمال		اتمام
آغازین	آغاز	اثباتی، اثبات شده	اثبات
افزوده، افزودن	**افزایش**	اثرات، اثربخش، اثر داشتن، اثر کردن	**اثر**
اقتصادی	اقتصاد	اجباری	اجبار
اقدامات، اقدام کردن	اقدام	اجتماعی	اجتماع
آگاهی، آگاهی ها	آگاه	اجتناب کردن	اجتناب
	اگر چه	اجرایی، اجرا شدن، اجرا کردن	اجرا
الزامات، الزامی	الزام	احاطه کردن، احاطه شدن	احاطه
الگوه ها، الگوی	الگو	احتمالات، احتمالی، احتمالا	احتمال
آماری	**آمار**	احساس شدن، احساس کردن، احساسی	احساس
امانتدار، امانتداری	امانت	اختصاصی، اختصاص دادن	اختصاص
امری	**امر**	اختیاری	اختیار
امکان داشتن، امکان پذیری، امکان پذیر	امکان	اخلاقی، اخلاقیات	اخلاق
	امکانات	ارائه کردن، ارائه شدن، ارائه دادن، ارائه ی	**ارائه**
	آموختن	ارتباطی، ارتباطات، مرتبط	ارتباط
انتشارات، منتشر	انتشار		ارزشیابی
انتظار رفتن، انتظار داشتن، انتظارات	انتظار	ارزشی، ارزش ها، ارزش ها ی	**ارزش**
انتقالی، انتقال دادن	**انتقال**	ارسالی، ارسال شدن	ارسال
انحرافات، انحرافی	**انحراف**		ارزیابی
اندازه ها، اندازه ی، اندازه گیری	اندازه		ازطرف
	انزوا	آزمایشی	آزمایش
منطبق	انطباق	آزمایشگاهی	آزمایشگاه
	انعطاف		اساسی
انقلابی	انقلاب	استثنایی، استثنا پذیر	استثنا
انگیزه ی	انگیزه	استخراجی، استخراج شدن	استخراج
	اولویت	استدلالی	استدلال
	اولیه		استعداد
	اهمیت		استمرار
ایجاد کردن، ایجاد شدن	ایجاد	استنباط ها، استنباط کردن	استنباط
ایفا کردن، ایفای	ایفا		استقرار
ایمنی، ایمن سازی	ایمن		استنتاج
	با توجه	استواری	استوار
بارزتر، بارزترین	بارز	آسیب ها، آسیب زدن	آسیب
بازدهی	بازده	اشاره شدن، اشاره کردن، اشاره داشتن، اشاره ای، اشاره ی	اشاره
بافتی، بافت ها	بافت	اشتباهی	اشتباه
بالغی، بالغین	بالغ	آشکاری، آشکار کردن، آشکار شدن	آشکار
	بالقوه		اصابت
	باوجود	اصطلاحات	اصطلاح
بخشی، بخش ها	**بخش**	اصلی،اصول، اصولی	اصل
	تجربی		بدست آمدن

بدست آوردن		تحریک	تحریکات، تحریک کردن
برابر	برابری	تحقیق	تحقیقی، تحقیقات، تحقیقاتی
برتر	برتری، برترین	تحلیل	تحلیلی، تحلیل ها
برجسته	برجسته تر، برجسته ترین	تحمل	
برخوردار		تحول	تحولات، تحولاتی
برخورد		تخمین	تخمین زدن
برطرف	برطرف کردن، برطرف شدن	ترتیب	
برعهده	برعهده ی	ترسیم	
برنامه	برنامه ی، برنامه ها، برنامه ریزی	ترکیب	ترکیبات، ترکیبی
بروز		تشخیص	تشخیصی، تشخیص دادن
برون		تشکیل	تشکیل دهنده، تشکیل دادن، تشکیل شدن
برهان		تصادف	تصادفی
بزرگ	بزرگی، بزرگتر،بزرگترین	تصرف	تصرفات
بسط	بسطی، بسط دادن	تصور	تصورات، تصور کردن، تصور شدن
بسنده کردن		تصویر	تصویری
بصر	بصر، بصری	تضاد	تضادها، متضاد
بعد	ابعاد	تعادل	تعادلی، متعادل
بقاء	ابقاء	تعاون	
بکارگیری		تعریف	تعریف شدن، تعریف کردن
بنابراین		تعهد	تعهدی، تعهدات
به صورت		تعیین	تعیین شدن، تعیین گردیدن، تعیین کردن
به علاوه		تغییر	تغییرات، تغییر دادن، تغییر یافتن
بهبود	بهبودی	تفسیر	
به ندرت		تقابل	
بهره	بهره گرفتن، بهره گیری، بهره وری، بهره جستن، بهره مندی	تقاضا	تقاضای، تقاضا داشتن
بیان	بیانگر، بیان کردن، بیان شدن	تقدم	
پاسخ		تقریب	تقریبی، تقریبا
پارامتر	پارامتر ها، پارامتری	تقسیم	تقسیم بندی، تقسیم کردن، تقسیم شدن
پایان	پایانی	تقویت	
پایدار	پایداری	تکمیل	تکمیل کردن
پایه	پایه ای، پایه ی	تکنیک	تکنیکی، تکنیک ها
پخش		تماس	
پدیده		تمایل	
پرداخت	پرداخته، پرداخت شدن، پرداختی	تمرکز	
پروژه		تناسب	
پزشکی		تناقض	متناقض، تناقضات، متناقضی
پژوهش	پژوهشی، پژوهشگر	تنظیم	
پنهان		توافق	توافقی
پیدا	پیدایش، پیدا کردن	توالی	متوالی
پیشرفت	پیشرفته	توانا	توانایی
پیشنهاد	پیشنهادی، پیشنهاد کردن	توجیه	
پیوسته	پیوستگی	**توسط**	
پیوند	پیوندی	**توسعه**	توسعه دادن، توسعه ی
تابع	تابعی، توابع	تولید	تولیدی، تولید شدن
تاثیر	تاثیرات، تاثیری	ثابت	
تبدیل		ثبات	
تثبیت		جابه جا	
تجاوز	تجاوز کردن	جایگاه	
تجربه	تجربه ها، تجربه ی	جایگزین	جایگزینی
جامع		درست	درستی

جامعه	جوامع	**درصد**	
جبران		درصورت	در صورتی
جدال		درک	
جدول	جدول ها	در معرض	
جزء	جزئی، جزئیات	درون	درونی
جستجو	جستجوی	دریافت	دریافت کردن، دریافت شدن
جسم	جسمانی، جسمی	دسترس	دسترسی
جفت	جفتی	دستگاه	دستگاهی، دستگاه ها
جلوگیری		دسته	دسته ها، دسته ی، دسته بندی
جمع	جمعبندی، تجمع، جمع آوری	دستیابی	
جنبه	جنبه ها، جنبه ی	دچار	
جنس		درطی	
جهت		دفاع	دفاعی
چاپ		دفع	دفع کردن، دفع شدن
چالش	چالش ها، چالشی	دقیق	دقیقی، دقیق تر، دقیقا
چرخه		دگرگون	دگرگونی
حاصل از		دلالت	
حاصل شدن		دوام	
حاکی از		دوران	
حالت	حالت ها، حالتی	**دوره**	دوره ی
حاوی		دهه	دهه ها، دهه ی
حجم		ذات	ذاتی
حداقل		ذکر	ذکر شدن
حداکثر		ذهن	ذهنی
حدود	حدودا	**رابطه**	رابطه ی
حذف	حذف شدن، حذف کردن	راهبرد	راهبردها
حرفه		راهنما	راهنمای، راهنمایی، راهنمایی ها
حفظ	حفظ کردن، حفظ شدن	رتبه	رتبه ی، رتبه ای، رتبه بندی
حقوق	حقوقی	رجوع	
حمایت	حمایتی، حمایت ها	رسم	رسمی، رسمیت، رسما
حمل	حامل	رفاه	رفاهی
حوزه	حوزه ی، حوزه ها	رفتار	رفتاری، رفتارها
خارج	خروج، خارجی، خارج شدن، خارج کردن	رفع	رفع کردن
خاص	خاصی، بخصوص	رقابت	رقابتی
خاصیت	خواص	**رقم**	ارقام
خالص	ناخالص	روال	
خدمت		**روش**	روش، روش ها
خصوصیات		رویکرد	رویکردی، رویکردها
خطا	خطای	روند	روندی
خلاصه	خلاصه ی، خلاصه ها، خلاصه ای	زمینه	زمینه ی
خلق		زوج	
خنثی		سابقه	سوابق
دائم	دائمی، دائما	ساخت	ساختار، ساختن
دال بر		سازگار	سازگاری
دامنه	دامنه ی، دامنه ها	**سازمان**	سازمانی، سازمان ها، سازماندهی
دانشگاه	دانشگاهی، دانشگاهیان، دانشگاهها	سبک	سبک ها
درآمد		سپس	
درباب		سخن	
درجه	درجه ی، درجات	سرانجام	
درخلال		**سطح**	سطحی، سطوح
سلسله مراتب		فرمول	فرمولی

سنت	سنتی	فرهنگ	فرهنگی
سنجش	سنجیدن	فشار	فشاری، فشار ها
سوال	سوالی، سوالات	فشرده	
سهم		فصل	فصل ها
سود	سودمند، سودمندی	فکر	فکری، افکار
سهولت		فلسفه	فلسفی، فلسفه ی، فلسفه ها
شاخص	شاخص ترین، شاخصی، شاخص ها	**قابل**	قابلیت
شامل		قابل استفاده	
شباهت	شبیه	قابل توجه	
شبکه	شبکه ی، شبکه ای، شبکه ها	قادر	قادر بودن
شرایط	شرایطی	قائل	قائل شدن
شرح	شرح دادن، تشریح	قالب	
شرط	شرطی	قانون	قانونی، قانونمند
شرق	شرقی	قدرت	
شروع		قسمت	قسمتی، قسمت ها
شفاف	شفافیت	قصد	
شناخت	شناختن، شناختی، شناخته	قطعه	قطعه ها
شناسایی		قاعده	قاعده ی، بیقاعده، قواعد
شیمیایی		قلمداد	
شیوه	شیوه ها، شیوه ای، شیوه ی	قلمرو	قلمروی، قلمروها
صادر	صدور، صادرات، صادر کردن، صادر شدن	قوت	
صحت		کافی	
صفت	صفات	کاهش	
ضرر	مضر، ضررها، بی ضرر	کسب	کسب کردن،کسب شدن
ضریب		کشور	کشوری، کشورها
ضمن		کمبود	کمبودها، کمبودی
طبقه	طبقه ی، طبقه ای، طبقه بندی	کمک	کمکی
طبیعی		کنترل	
طرح	طراح، طراحی، طرح ها	کیفیت	کیفی
ظاهر	ظاهری، تظاهر، ظاهرا، ظاهر شدن	گسترده	گسترده تر، گسترده ای
عامل	عوامل	گسترش	گسترش ها، گسترش دادن
عبارت	عبارتی، عبارات	گسستن	گسسته
عبور		گواه	گواهی
عدم		گوناگون	گوناگونی
عرضه	عرضه کردن	لایه	لایه ی، لایه ها
عضو	اعضا	لحاظ	لحاظ کردن، لحاظ شدن
علاقه	علاقه ی، علاقه مندی	لحظه	لحظه ها، لحظه ی، لحظه ای
علامت	علامت گذاری	ماندگار	ماندگاری، ماندگار تر
علم	علوم، علمی	مانع	مانع شدن، ممانعت، مانعی
عمده		مبارزه	
عمل	عملکرد، عملیات، عملی	مبحث	مبحثی
عموم	عمومیت	مبداء	
غالب	غالبا	مبنا	مبنای، بر مبنای
غرض	غرضی	متخصص	متخصصین، متخصصان
غلبه		متداول	متداول ترین
فرایند	فرایند ها	متعاقب	متعاقبا
فراهم	فراهم کردن، فراهم شدن	متعدد	متعددی
فرد	فردی	متعلق	متعلقه، تعلق
فرض	فرضی، فرضیه، فرضیه ها، فرض ها	**متفاوت**	متفاوتی، تفاوت، تفاوت ها
فرعی		متقابل	
متقارن		مطابق	مطابقت

متناسب		**مطالعه**	مطالعه ی، مطالعه ای
متناوب	تناوب، تناوبی	مطرح	
متنوع	متنوعی، تنوع	مطلب	
متوسط		مطلق	مطلقی
متوقف		**معادل**	معادله
مثال	مثالی، به عنوان مثال، برای مثال	معتبر	
مثبت		معرف	معرفی
مجاز		معرفت	
مجاور	مجاورت	معروف	معروف تر، معروفی
مجدد	مجددا	معقول	
مجرد		معلوم	
مجزا		معمول	معمولی، معمولا، معمول ترین
مجموع	مجموعه	معنی	معنی دار، معانی
مجهز		معیار	معیار ها
محاسبه	محاسبات، محاسبه کردن، محاسبه شدن	معین	
محدود	محدودیت، محدود کردن، محدودیت ها	فهم	مفهوم، مفهومی
محدوده		مفید	
محرک		مقاله	
محروم	محرومیت	مقام	مقامات
محسوس	محسوسات	مقاومت	مقاومتی
محصول	محصولات، محصولاتی	مقایسه	مقایسه ی
محض		**مقدار**	
محقق	محققین، محققان	مقدم	مقدمات، مقدمه
محلول	محلول ها	مقرر	
محیط	محیطی، محیط ها	مقطع	مقاطع، مقطعی، مقطع ها
مخالف		مقوله	مقوله ی، مقوله ها
مختلط		مقیاس	مقیاس ها
مخلوط		مکمل	مکمل ها
مداخله	مداخله ی	ملاحظه	
مداوم		ملازم	ملازمات، ملازمه ی
مدت		ممنوع	
مدرس		مناسب	مناسبی، مناسب ترین، نا مناسب
مراجعه		منبسط	انبساط
مراقبت	مراقبت ها، مراقبتی	**منبع**	منابع
مربوط به		منجر به	
مرحله	مرحله ی، مرحله ای	منحصر	منحصرا
مرور	مروری	منشاء	
مساحت	مساحت ها، مساحتی	منظر	
مسئول	مسئولیت، مسئولین	منطق	منطقی
مستعد		منطقه	منطقه ای، منطقه ی
مستقیم	مستقیما، غیر مستقیم، مستقیمی	منعکس	
مستلزم		منفی	
مستند	مستندات	مواجه	
مشابه		موثر	
مشارکت	شرکت	موجب	
مشاهده		موجود	
مشتق	مشتقات	**مورد**	موارد، مواردی
مشخص	مشخصات، مشخص ها، مشخص کردن، مشخص شدن	مورد توجه	
مشهود	مشهودی، نامشهود	موزون	موزون سازی، موزون شدن
مصرف	مصرفی	موضوع	موضوعیت، موضوعات، موضوعی
موفق	موفقیت		

موقعیت			
مهارت	مهارت ها		
میانگین			
میزان			
ناحیه	ناحیه ی، نواحی		
ناشی	ناشی از		
نتیجه	نتیجه کیری، نتایج		
نحوه	نحوه ی		
نسبت دادن			
نظارت			
نظام	نظام ها		
نفوذ			
نقد	انتقاد		
نقص	نقصان		
نقل			
نگرش	نگرش ها		
نماد	نمادین		
نمره	نمره ی، نمرات		
نمونه	نمونه ها، نمونه ی		
نوسان	نوسانی، نوسانات		
نوار	نواری		
نیاز	نیاز ها، نیازمند		
وابسته			
واسطه	واسطه ی، وساطت		
واضح	واضح تر		
واکنش	واکنش ها		
ورود	ورودی		
وسیع	وسعت		
وضعیت	وضعیتی		
وضوح			
وقوح			
ویژه	ویژه ی، ویژه ای		
هماهنگ	هماهنگی		
همانند			
هدف	هدفی، هدف ها		
هرچند			
هسته	هسته ای، هسته ی		
همچنین			
همراه			
همکار	همکاری، همکاران		
همواره			
هنجار	هنجارها، ناهنجاری		

Appendix B

The articles were taken from the following journals:

1. *Agriculture Research* Journal taken from volume 7, issue 1-2
2. *Iranian Journal of Field Crops Research* taken from volume 4, issues 1
3. Journal of *Wood & Paper Science Research* taken from volume 26, issue1
4. Journal of *Water Research in Agriculture* taken from volume 24, issue 2
5. Journal of *Studies on Iranian Islamic City* taken from issue 3
6. Journal *Housing & Rural Environment* taken from issue 133
7. *Honarhaye Ziba* Journal taken from issue 37
8. *Maremate Asar & Baftaye Farhangi* Journal taken from issue 1
9. Journal of *Ethics in Science & Technology* taken from issue 1
10. Journal of *Behavioral Science* taken from volume 5,issue 2
11. Journal of *Religious Thought* taken from volume 40
12. Journal of *Management Accounting* taken from issue 6
13. *Veterinary* Journal taken from issue 82
14. Journal of *Veterinary Research* taken from issue 1
15. *Iranian Journal of Veterinary Research* taken from issue 9-10
16. *Geoscience* Journal taken from issue 75
17. Journal of *Plant Biology* taken from issue 1
18. Journal of *Economic Geology* taken from volume 1, issue 1
19. *Iranian Physical* Journal taken from volume 10, issue 1
20. Journal of *Mechanical Aerospace* taken from volume 1, issue 2
21. Journal of *Industrial Engineering* taken from issue 1
22. *Petroleum Research* Journal taken from issue 66
23. Journal of *Civil Engineering* taken from issue 1
24. Journal of *Medical Plants* taken from issue 38
25. Journal of research in *Behavioral Sciences* taken from issue 1
26. *Ofoghe Danesh* Journal taken from issue 4
27. *Strides in Development of Medical Education* taken from issue 2
28. Journal of *Plant Production* taken from volume 22