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# Developing The Aawl-Ps: Academic Word List For Physical Sciences

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***Abstract***

*This study aims to develop the Academic Article Word List for Physical Sciences (AAWL-PS), a corpus-based academic vocabulary list specifically designed for texts in the physical sciences. The development of this word list was motivated by the need for a more targeted lexical resource that reflects the linguistic characteristics of scientific disciplines such as Chemistry, Engineering, Physics, Mathematics, and Computer Science. The corpus used in this study consisted of 366 Scopus-indexed journal articles from nine sub-disciplines in the physical sciences, comprising a total of 2,632,817 running words. The study employed a quantitative corpus-based approach using AntWordProfiler software to identify and analyze high-frequency academic vocabulary items. Strict criteria of frequency, range, and dispersion were applied to extract the most representative and pedagogically useful vocabulary items. As a result, 350 high-utility word families were identified and compiled into the AAWL-PS. Comparative lexical coverage analysis revealed that AAWL-PS provides higher coverage of physical sciences texts than both the Academic Word List (AWL) and the New Academic Word List (NAWL). Specifically, AAWL-PS achieved 11.74% coverage of the primary corpus, outperforming NAWL (10.47%) and AWL (9.75%) despite containing fewer word families. A secondary validation test using a separate corpus of 824,056 tokens further confirmed the effectiveness of AAWL-PS, showing equivalent percentage coverage to NAWL but with higher token frequency. These findings demonstrate the importance of discipline-specific academic vocabulary lists in supporting English for Academic Purposes (EAP) instruction. The AAWL-PS can serve as a practical lexical resource for improving vocabulary acquisition, reading comprehension, and academic writing skills among students, researchers, and educators in the physical sciences.*

***Keywords:*** *Academic Word List, Academic Writing, Physical Science, Vocabulary Learning, Academic Journal Articles*

## 1. Introduction

Academic writing is a unique and complex form of communication. Scholars have long tried to identify and compile an inventory of words that are frequently used in academic contexts [1], [2]. Academic word lists are essential instruments for students, educators, and researchers, providing structured vocabulary assistance to improve reading comprehension, writing fluency, and overall academic performance. In addition to their pedagogical functions, these lists allow instructors to concentrate on vocabulary that is both high-frequency and high-utility in English for Academic Purposes (EAP) courses.

Corpus linguistics has revolutionized academic vocabulary research by facilitating the systematic analysis of large-scale academic texts. This methodology offers empirical data on the frequency and distribution of terms across various genres and disciplines[3]. Researchers can generate more accurate academic vocabulary by analyzing these corpora [4]. Although the Academic Word List (AWL) by [5] and the New Academic Word List (NAWL) by [6] have been widely used and have been beneficial, there is a growing consensus that general word lists frequently fail to capture field-specific lexical patterns. For instance, the vocabulary employed in the physical sciences is substantially different from that employed in the humanities, law, or education[7]. As such, vocabulary learning becomes more efficient when guided by discipline-specific academic word lists.

Several prior studies have addressed this requirement by creating academic word collections in various fields. Among the ones are academic vocabulary lists for applied linguistics [8], chemistry [3], and medical sciences [9]. The publication of other research in fields such as nursing [10], environmental science[11], and public health highlights even more the growing relevance of discipline-specific corpora in vocabulary education. Those lists are produced by means of corpus analysis of domain-specific texts to ensure that they meet both frequency and range criteria. However, many previous studies are limited in their adaptability, which calls for manual updates even with these advances and might not fairly represent the most recent innovations in academic publications.

Therefore, current academic word list resources including the AWL, NAWL, and AVL are derived from corpora spanning several genres, including spoken discourse, fiction, and student writing. This mix produces word choices that could not fairly reflect the vocabulary needs of scientists and students reading academic journal articles. The overrepresentation of general-purpose vocabulary and the underrepresentation of specialized terminology can result in gaps in learners' academic literacy. Hence, there is a pedagogical and linguistic need for more focused academic vocabulary tools based on authentic disciplinary texts.

Academic vocabulary plays an important role in supporting students comprehension of academic texts, particularly in science-related disciplines. In physical sciences, students are frequently exposed to journal articles, research reports, and scientific publications containing a large number of academic and technical terms. Limited knowledge of academic vocabulary may affect students ability to understand scientific information and produce appropriate academic writing. Therefore, the availability of a discipline-specific academic word list is important to support vocabulary learning in physical sciences because such vocabulary support may help students engage more effectively with scientific literature and develop greater understanding of interpreting discipline-specific academic texts.

Furthermore, the rapid development of science and technology has influenced the vocabulary used in academic publications. Disciplines such as engineering, computer science, and energy studies continuously introduce new concepts and terminologies into scientific discourse. As a result, general academic word lists may not adequately represent the vocabulary commonly found in physical science journal articles. This condition highlights the need for a more focused and updated academic word list that reflects actual language use in physical sciences academic publications.

To address this gap, the present study develops the Academic Article Word List for Physical Sciences (AAWL-PS), a corpus-driven list constructed from 366 Scopus-indexed journal articles across nine sub-disciplines of the physical sciences. These include chemistry, computer science, engineering, physics and astronomy, and earth and planetary sciences, among others. The corpus contains over 2.6 million tokens and was analyzed using AntWordProfiler, with word selection based on strict frequency and range thresholds. The resulting 350-word families offer a tailored, discipline-specific vocabulary resource with higher lexical coverage than existing lists. By aligning with actual usage in physical science journal publications, the AAWL-PS provides practical value for learners and educators seeking to enhance academic reading, writing, and vocabulary instruction in scientific contexts.

**Vocabulary Classifications**

Vocabulary is a fundamental component of language acquisition and communication. Wilkins (1972) famously declared, "Without grammar, very little can be communicated; without vocabulary, nothing can be communicated," emphasizing the superiority of vocabulary over grammar in effective communication. In the same vein, [12] contends that vocabulary is a critical element of language use, particularly in the context of second language acquisition. Thus, learners must acquire communicative competence by mastering their vocabulary.

Nevertheless, the acquisition of vocabulary in a second or foreign language context is fraught with various obstacles.[13] asserts that these challenges are not solely caused by the quantity of lexical forms (e.g., morphemes, derivatives, compounds) but also by other linguistic factors, including complexity, orthography, length, morphology, and pronounceability. To confront these obstacles, researchers have suggested various classifications of vocabulary based on frequency and utilization, particularly in academic and general texts.

[14] suggests a vocabulary classification that is widely accepted and based on frequency. This classification includes four categories: (1) High-frequency words, (2) Academic words, (3) Technical words, and (4) Low-frequency words. The most frequently occurring words in general texts are those that are essential for fundamental comprehension. [15] covered approximately 80% of general texts with the General Service List (GSL), which comprises 2,000 word families. In 2013, Browne, Culligan, and Phillips developed the New General Service List (NGSL), an updated version that provides even more comprehensive coverage (up to 92%) with 2,800 meticulously selected words.

In contrast, academic terms are more frequently used in educational texts than in commonplace language. Nation (2001) observes that academic words comprise approximately 9% of the vocabulary in academic textbooks. As students progress to higher education and academic discourse, these terms become indispensable. Coxhead's

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(2000) Academic Word List (AWL) is the most influential list in this category. It comprises 570 word families that are derived from a corpus of 3.5 million academic words across four subject areas: arts, commerce, law, and science.

Since then, several academic word lists have undergone updates and expansions. developed the New Academic Word List (NAWL), which comprises 963 word families derived from a corpus of 288 million academic words. [16] created the Academic Vocabulary List (AVL), consisting of 3,000 lemmas instead of word families. The AVL was developed based on 120 million academic words from the Corpus of Contemporary American English (COCA).

Although AWL, NAWL, and AVL are intended for general academic purposes, recent research has underscored the necessity of field-specific academic word lists. Examples of field-specific academic word lists include those for nursing [10], chemistry [3], and medicine [17]. By encapsulating the distinctive vocabulary requirements of particular disciplines, these lists circumvent the constraints of general academic lists.

The third category, technical words, encompasses vocabulary that is exclusively employed in specialized domains. According to [18], technical vocabulary accounts for approximately 5% of the words in general documents. These terms are frequently discipline-specific and have precise meanings, such as "scalpel" in medical contexts. [12] defines technical terms as those that have narrowly defined meanings within specific disciplines.

Technical vocabulary has historically received relatively less scholarly attention than academic vocabulary, despite its significance. To systematically define and identify technical vocabulary, Chung and Nation (2003, 2004) proposed a four-point scale and four identification approaches (rating scale, contextual indicators, dictionaries, and computer-based tools). Their work inspired additional research into specialized technical vocabulary, including (1) university lectures (Lessard-Clouston, 2010) and (2) Movies and TV programs (Csomay & Petrovic, 2012). (3) Vocabulary identification methods that are based on corpora (Kwary, 2012). In light of this context, the objective of the current study is to develop an Academic Article Word List (AAWL) that is derived from journal articles from four distinct scientific disciplines. This list will be updated and discipline-specific, and it will incorporate previous methodologies.

**Academic English Word Lists**

Throughout the years, a multitude of academic word lists have been created for research and pedagogy. These lists vary with respect to their selection criteria, corpus base, target audience, and scope. One of the most frequently cited and utilized academic vocabulary lists is Coxhead's AWL[5]. It was created by analyzing a 3.5-million-word corpus of 414 academic texts that encompassed four subject areas arts, commerce, law, and science and were further divided into 28 sub-disciplines.

Coxhead (2004) selected the words for the AWL using three main criteria. The first criterion, specialized co-occurrence, defines the the academic General Service List (GSL). Second, words must be used at least ten times in a minimum of fifteen subject areas. The last is frequency: the academic corpus must contain a minimum of 100 instances of each word.

The outcome was a compilation of 570 word families that were regarded as indispensable for university-level students. This list has significantly influenced the development of vocabulary research and instructional materials. However, Coxhead's methodology has been subjected to criticism by numerous scholars, despite its influence. They challenge the utilization of word families, contending that this method may obfuscate semantic nuance and part-of-speech distinctions. Instead, they recommend the use of lemmas.

This preference for the use of lemmas is based on their ability to preserve distinction in meaning and grammatical functions more precisely than word families. Other scholars have also point out this apprehension, asserting that the absence of part-of-speech labeling restricts the practical applicability of the AWL. Moreover, the corpus used by Coxhead excluded certain fields, most notably, health sciences. This omission potentially reduces the usefulness of the AWL for students and professionals in those disciplines.

Nevertheless, Coxhead's methodology has provided a strong foundation for later academic word list research, especially in the development of field-specific lists. Researchers such as Yang (2015), Valipouri and Nassaji (2013), and Liu and Han (2015) have adopted Coxhead's approach in creating specialized academic word lists tailored to their fields of study. This study adopts Coxhead's (2000) methodological framework to compile a new Academic Article Word List across four scientific disciplines. While acknowledging critiques of the word family approach, the present research prioritizes comparability and consistency with prior widely used academic word list studies.

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## 2. Method

To formulate the Academic Article Word List for Physical Sciences (AAWL-PS), this study employed a quantitative research approach. Quantitative methodology provides an objective framework for data analysis and minimizes researcher bias, resulting in a more precise and reliable interpretation of linguistic data (Dörnyei, 2007). This approach is particularly appropriate for the present study, which involves the statistical classification of vocabulary based on frequency and distribution patterns. The central data for analysis were word frequencies and range (distribution across texts), processed quantitatively using corpus linguistics tools.

The objective of this study was to create a specialized academic word list specifically for the physical sciences. Accordingly, the population under analysis consisted of articles published in international journals. For several reasons, we selected Elsevier as the exclusive source for data collection. First, Elsevier contributes the largest share of scientific publications indexed in Scopus. Second, it is recognized as one of the top three global academic publishers. Third, Elsevier's journal entries include comprehensive metadata such as ISSNs and five-year impact factors, ensuring academic rigor and transparency.

To select the sample, cluster sampling was applied. This technique identifies and includes clusters that are representative of the entire population. The sampling criteria were as follows: (1) Only open-access journals were selected; (2) journals must report a five-year impact factor; (3) journals must be published in English; and (4) only journal articles published between 2015 and 2025 were included in the sample.

The primary corpus includes 366 journal articles that together contain a total of 2,632,817 running words. These articles span nine sub-disciplines within the physical sciences: Chemical Engineering, Chemistry, Computer Science, Earth and planetary sciences, Energy, Engineering, Materials Science, Mathematics, and Physics and Astronomy. The compiled corpus was processed using AntWordProfiler, a corpus analysis tool designed to identify high-frequency word families. The parameters were set to a minimum frequency of 10% of the total texts, with a range threshold of 10.

Figure 1. AntWordProfiler Used in Defining AAWL-PS

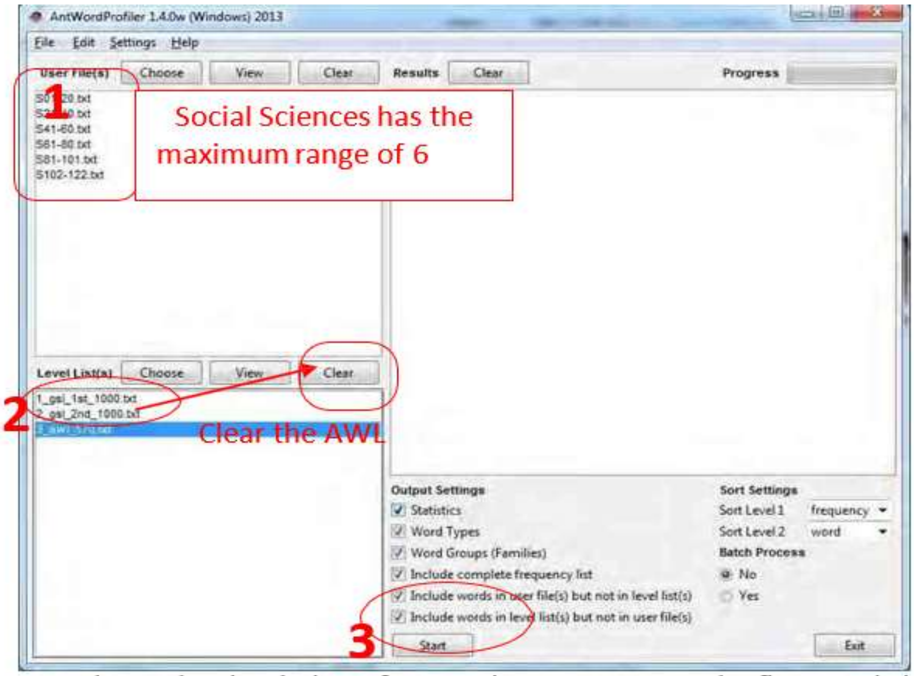


Figure 1 shows the simulation of processing AAWL-PS. The first step is inserting clean data into Antprofiler. Then, clear AWL-570 to extract AAWL-PS. Then, check all the output settings and click Start. This analytical process allowed for the extraction of the most representative academic vocabulary used in physical science journal articles, resulting in the formulation of the AAWL-PS, which contains 350 word families.

## 3. Results and Discussion

Elsevier classifies Physical Science areas into nine sub-disciplines, which are (1) Chemical Engineering, (2) Chemistry, (3) Computer Science, (4) Earth and Planetary Science (5) Energy, (6) Engineering, (7) Materials Science, (8) Mathematics, and (9) Physics and Astronomy. Despite having more numerous sub-disciplines among the other science disciplines, the formulation of the academic word list for these science disciplines is rarely formulated. Therefore, the formulation of academic word lists for these physical science areas is crucial. The Academic Article Word List for Physical Science (hereafter: AAWL-PS) was formulated to meet the need for an academic word list in the physical science area.

This AAWL-PS is a specific academic word list built from physical science international journal articles. There were 366 journal articles of physical sciences collected and processed. We processed up to 2,603,183 tokens, also known as running words, to formulate the AAWL-PS. The corpus data to build this AAWL-PS is the biggest compared to other corpora to formulate AAWL in other disciplines. We expected this large data corpus to serve as a representative academic dataset, enabling the construction of valid academic article word lists in the physical sciences. As a result, 350-word families were extracted as valuable word lists, particularly in a Physical Science environment (See Appendix 1).

To check the validity of this AAWL-PS formulation, it was also checked and compared with the prior academic word lists, AWL and NAWL. The 2,603,183-word tokens from the initial corpus were used as testers. The comparison tabulation of the AWL, NAWL, and AAWL-PS is presented in Table 1.

Table 1. The Coverage of AWL and AAWL-PS in the 2,603,183 Word Tokens (Initial Corpus)

| File | Tokens | Tokens (%) | Word Families |
|---|---|---|---|
| AWL | 253,694 | 9.75 | 570 |
| NAWL | 272, 427 | 10.47 | 880 |
| AAWL-PS | 305,591 | 11.74 | 350 |

The coverage of AWL, NAWL, and AAWL-PS, according to Table 1, reached above 9%, making those three academic words lists reliable word list formulations. Table 4.5 also represents the existence of the AAWL-PS as the new reputable formulation of academic article word lists for physical sciences, which have the same level as AWL and NAWL. Despite the minimum word families (350-word families), AAWL-PS has more coverage than the prior formulations (AWL and NAWL).

The table shows the expected result that AAWL-PS has higher coverage than NAWL and AWL. This higher lexical coverage is significant because it may reduces learners' unknown vocabulary burden and improve comprehension of academic texts within physical scientific disciplines. This result can be influenced by the use of the initial corpus as the validity checker. AAWL-PS covers 11.74% of the text, or 1.27% more than NAWL as the second word list. In the meantime, AAWL-PS was noted only to be 1.99% different from AWL.

To avoid conflict, another corpus was built to check the significance of those three formulations. There were 178 journal articles, or 824,056 running words, processed to figure out the significance of those three academic word list formulations. The comparison tabulation of the AWL, NAWL, and AAWL-PS is presented in Table 2.

Table 2: The Coverage of AWL and AAWL-PS in the 824,056 Word Tokens (Second Corpus)

| File | Token | Tokens (%) | Word Families |
|---|---|---|---|
| AWL | 75,069 | 9.11 | 570 |
| NAWL | 75,625 | 9.18 | 880 |
| AAWL-PS | 75,651 | 9.18 | 350 |

This second validity test presents interesting results. According to the data, AAWL-PS and NAWL have the same token percentage (9.18%). However, a visible difference can be seen in the token column, where AAWL-PS has a slightly higher token count than NAWL (26-token difference).

The coverage of this AAWL-PS has slight differences with AWL and NAWL. However, this AAWL-PS had better coverage than AAWL-SS, since, in the first test on a larger corpus, AAWL-PS could constitute almost 12% in physical science journal articles. AAWL-PS, therefore, can be a better academic word list to serve physical science disciplines despite the insignificant result of word list coverage in the second test.

The results of this study reveal that the Academic Article Word List for Physical Sciences (AAWL-PS) provides significantly higher lexical coverage of physical sciences texts compared to general academic word lists such as Coxhead's Academic Word List (AWL) (2000) and Browne et al.'s New Academic Word List (NAWL)

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(2013). Despite containing only 350 word families, the AAWL-PS outperforms these larger lists AWL (570 families) and NAWL (880 families) in covering specialized vocabulary frequently used in disciplines like physics, engineering, and computer science. This finding supports the view that academic vocabulary is not universal across disciplines but rather highly domain-specific, a position widely supported in ESP research [19], [20]The robust performance of the AAWL-PS across both the primary and secondary corpora suggests that this list captures core disciplinary lexis relevant to a broad range of physical sciences texts. For instance, high-frequency items such as variable, simulation, the terms "system" and "equation" are emblematic of scientific communication, yet they are often absent from general academic word lists. This phenomenon illustrates the limitation of relying solely on general academic word lists for students or researchers working within STEM disciplines, as many crucial terms for comprehension and production are overlooked. In contrast, the AAWL-PS offers a more accurate reflection of actual lexical demands, as it is derived from a large, representative corpus of Scopus-indexed physical sciences journals.

From a theoretical perspective, the findings of this study contribute to the field of applied corpus linguistics by reinforcing the value of discipline-specific lexical profiling. As Nation (2016) emphasized, vocabulary lists must be both pedagogically manageable and relevant to learners' needs, and the AAWL-PS appears to fulfill both criteria. By limiting the list to 350-word families, it becomes feasible to incorporate it into a single semester of EAP or ESP instruction, thus enhancing its practical applicability. Furthermore, it aligns with recent calls for data-driven vocabulary instruction grounded in authentic academic discourse[7].

Pedagogically, the implications of the AAWL-PS are considerable. EAP and ESP practitioners can utilize the list to develop materials and tasks that focus on discipline-relevant vocabulary acquisition, particularly for students in engineering, computer science, physics, and mathematics. Vocabulary learning activities such as concordance analysis, collocation practice, and writing scaffolding can be structured around these high-utility items. Because of its compact size and targeted nature, the AAWL-PS can help streamline the learning process while still offering strong coverage, potentially leading to better reading comprehension and more fluent academic writing among STEM students. In STEM-focused EAP and ESP contexts, discipline-specific vocabulary resources such as the AAWL-PS may contribute to more effective academic literacy development. Specialized vocabulary lists can help reduce lexical burden by prioritizing high-frequency and high-utility terms commonly encountered in scientific discourses. As a result, students, educators, and researchers may be better prepared to engage with research articles, laboratory reports, and other academic materials within their disciplines.

Another important finding of this study is that AAWL-PS demonstrates relatively high lexical coverage despite containing fewer word families than AWL and NAWL. This finding suggests that a discipline-specific academic word list may provide more effective coverage because the selected vocabulary is closely related to the target discipline. In addition, the smaller number of word families may provide practical advantages for vocabulary learning and classroom instruction since learners can focus on more relevant academic vocabulary items.

The corpus-based approach applied in this study also contributes to the reliability of the AAWL-PS formulation. The word list was developed from authentic Scopus-indexed journal articles representing several physical science disciplines. Therefore, the vocabulary included in the AAWL-PS reflects actual language use in physical science academic publications. In addition, the AAWL-PS formulation may also reflects recent terminologies and contemporary disciplinary communications patterns within the physical science. This characteristic makes AAWL-PS potentially useful as a vocabulary resource for students, educators, and researchers in physical sciences.

Nonetheless, the present study is not without limitations. The AAWL-PS is constructed. This analysis is based on written academic prose, particularly journal articles, and may not fully represent the lexical demands of other academic genres, such as oral presentations, textbooks, lab reports, or dissertations.

Hence, future studies should expand the scope of genre coverage and also consider multiword expressions (e.g., *in this study*, *as shown in Figure 1*), which are crucial components of scientific discourse but not captured in word-family-based lists. In addition, periodic updates of the corpus data are necessary, considering that the science disciplines continue to evolve rapidly. Moreover, further research is needed to examine the effectiveness of the AAWL-PS in actual classroom contexts through intervention studies and learner uptake analysis.

## 4. Conclusions

Although this AAWL-PS constitutes many sub- disciplines, the formulation of academic word list in this science discipline was relatively small. Therefore, the AAWL-PS is a formulation with highly urgency. Through compiling 366 journals and processing 2,603,183 running words, the final 350 word families of AAWL-PS had been formulated (as shown in Appendix 1). This AAWL-PS shows positive coverage test compared to AWL and NAWL. Both of the coverage tests showed that AAWL-PS has higher coverage than the former formulations.

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However, based on the second coverage test the distinction of the coverage between AAWL-PS and NAWL are not significant. This AAWL-PS should be the primary formulation for Physical Science academician. The first reason is that AAWL-PS is built from large and representative corpus data. Second, AAWL-PS is specifically built from Physical Science journal materials only. Third, given 350 word families of AAWL-PS, this formulation serves better package and relatively high coverage test.

HEADWORD OF AAWL-PS

figure, data, function, energy, analyse, method, process, section, vary, parameter, structure, define, phase, obtain, require, range, area, similar, distribute, generate, assume, simulate, image, region, element, cell, approach, layer, maximum, potential, compute, linear, component, velocity, correspond, equation, dense, dimension, peak, algorithm, design, indicate, stress, constant, initial, source, estimate, ratio, approximate, complex, matrix, thermal, previous, technique, minute, series, error, mode, occur, refer, domain, theory, stable, electron, mechanism, dynamic, interact, fuel, react, investigate, node, concentrate, atom, final, site, hence, theorem, input, trace, denote, response, network, achieve, feature, volume, impact, cycle, interface, derive, accurate, predict, finite, couple, contact, vector, identify, plot, equilibrium, normal, remove, period, available, positive, core, code, major, consistent, scheme, formula, via, constrain, sequence, implement, locate, column, evaluate, deform, transition, geometry, select, crystal, ion, diffuse, orient, construct, transform, diameter, transfer, negative, output, deviate, research, globe, demonstrate, contribute, individual, interpret, optimal, resolution, hydrogen, graph, polynomial, uniform, spectrum, concrete, integrate, symmetry, device, minimum, primary, create, expose, solar, magnet, axis, optimise, fraction, cylinder, conclude, index, proceed, appendix, environment, laser, contrast, aggregate, spatial, evolve, sphere, strategy, version, overall, scenario, focus, software, equivalent, evidence, conduct, bulk, internal, parallel, correlate, dominate, role, whereas, emit, physical, task, scale, abstract, subsequent, invariant, channel, induce, prior, involve, affect, sum, transmit, radius, magnitude, context, coordinate, imply, instance, furthermore, lattice, volt, height, grid, technology, spectre, issue, decompose, depend, author, detect, assess, gradient, keyword, optic, vertical, capacity, valid, radial, discrete, relevant, aspect, metre, appropriate, external, fusion, map, random, cluster, angular, propagate, release, statistic, transport, distinct, threshold, communicate, differential, factor, target, electronic, framework, unique, platform, rotate, project, visible, binary, pulse, inverse, despite, fundamental, symbol, static, ensure, link, alternative, concept, capture, objective, arbitrary, current, nuclear, expansion, principal, trend, homogeneous, compress, planar, thermodynamic, consist, medium, minimal, substrate, web, activate, notate, incident, interval, regress, architecture, dope, visual, regime, classic, mobile, attribute, shift, versus, integer, baseline, compact, convention, horizontal, enhance, temporal, apparent, consequent, frequent, stochastic, duration, dual, identical, subset, vertex, store, add, relax, cylindrical, adjacent, intermediate, evident, recall, continuum, establish, exhibit, ambient, circuit, publish, summary, underlie, curve, dash, illustrate, principle, novel, distort, calibrate, consequence, converge, nevertheless, setup, wavelength, goal, percent, consume, extract, array, compose, weight, diagram, explicit.

## Reference

[1] R. Simpson-Vlach and N. C. Ellis, "An academic formulas list: New methods in phraseology research," *Appl. Linguist.*, vol. 31, no. 4, pp. 487–512, 2010, doi: 10.1093/applin/amp058.

[2] S. M. Yimam, C. Biemann, and O. Majewska, "Learning academic vocabulary from domain-specific corpora: A case study of computer science," in *Proceedings of the 12th Language Resources and Evaluation Conference (LREC 2020)*, European Language Resources Association (ELRA), 2020, pp. 4415–4423. [Online]. Available: https://aclanthology.org/2020.lrec-1.543

[3] L. Valipouri and H. Nassaji, "A corpus-based study of academic vocabulary in chemistry research articles," *J. English Acad. Purp.*, vol. 12, no. 4, pp. 248–263, 2013, doi: 10.1016/j.jeap.2013.07.001.

[4] Z. H. Pathan, Z. E. Aldersi, and A. A. Aldhafiri, "Exploring the academic vocabulary in ESP science textbooks: A corpus-based analysis," *Cogent Educ.*, vol. 5, no. 1, pp. 1–17, 2018, doi: 10.1080/2331186X.2018.1470927.

[5] A. Coxhead, "The Academic Word List (AWL)," 2000. [Online]. Available: https://www.victoria.ac.nz/lals/resources/academicwordlist/

[6] C. Browne, B. Culligan, and J. Phillips, "The New Academic Word List (NAWL)," 2013. [Online]. Available: http://www.newgeneralservicelist.org

[7] A. Coxhead and P. Byrd, "Preparing writing teachers to teach the vocabulary and grammar of academic prose," *J. Second Lang. Writ.*, vol. 16, no. 3, pp. 129–147, 2007, doi: 10.1016/j.jslw.2007.07.002.

[8] R. Khani and K. Tazik, "Towards the development of an academic word list for applied linguistics research articles," *RELC J.*, vol. 44, no. 2, pp. 209–232, 2013, doi: 10.1177/0033688213488432.

[9] K. Tazik, R. Khani, and K. Shabani, "Developing a medical academic word list," *System*, vol. 109, p. 102888, 2022, doi: 10.1016/j.system.2022.102888.

[10] M.-N. Yang, "A nursing academic word list," *English Specif. Purp.*, vol. 37, pp. 27–38, 2015, doi: 10.1016/j.esp.2014.05.003.

[11] Q. Xie and Y. Zhang, "Constructing an academic word list for environmental science," *English Specif. Purp.*, vol. 63, pp. 36–49, 2021, doi: 10.1016/j.esp.2021.02.003.

[12] N. Schmitt, *Researching Vocabulary: A Vocabulary Research Manual*. Palgrave Macmillan, 2010.

[13] V. Takac, *Vocabulary Learning Strategies: A Guide for Teachers*. Cambridge University Press, 2008.

DOI: https://doi.org/10.31004/riggs.v5i2.8754

[14] I. S. P. Nation, *Making and using word lists for language learning and testing*. John Benjamins Publishing, 2016. doi: 10.1075/z.201.
[15] M. West, *The General Service List of English Words*. Longman, 1953.
[16] D. Gardner and M. Davies, "A new academic vocabulary list," *Appl. Linguist.*, vol. 35, no. 3, pp. 341–362, 2014, doi: 10.1093/applin/amt037.
[17] L. Lei and M. Liu, "Developing a medical academic word list: A case study," *English Specif. Purp.*, vol. 43, pp. 30–49, 2016, doi: 10.1016/j.esp.2016.01.003.
[18] I. S. P. Nation, *Learning Vocabulary in Another Language*. Cambridge University Press, 2001.
[19] K. Hyland and P. Tse, "Is there an 'academic vocabulary'?," *TESOL Q.*, vol. 41, no. 2, pp. 235–253, 2007, doi: 10.1002/j.1545-7249.2007.tb00058.x.
[20] J. Ward, "A basic engineering English word list for less proficient foundation engineering undergraduates," *English Specif. Purp.*, vol. 28, no. 3, pp. 170–182, 2009, doi: 10.1016/j.esp.2009.04.001.

DOI: https://doi.org/10.31004/riggs.v5i2.8754