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Research Paper

Research Themes and Sub-Themes in Academic Wordlist Studies Between 2000 and 2020: A Systematic Review

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Abstract

English academic vocabulary is significant for learning and teaching academic reading comprehension and writing skills for both native and non-native speakers. Hence, it is essential for academics including researchers, teachers, learners, material developers, and syllabus designers to know what has been done on academic word list development. This implies a systematic review. The current systematic review tended to identify, describe, appraise, and synthesize main themes and sub-themes as well as applications and implications of academic word list development from 2000 to 2020. Overall, 60 studies met the established criteria. Different themes and sub-themes were identified. Also, applications and implications were categorized based on their main themes. Limitations, suggestions for further study, and implications were also discussed.

Keywords: Academic Vocabulary; Systematic Review; Themes and Sub-Themes; Academic Word Lists.

1. Introduction

During the last two decades, academic vocabulary studies have been the focus of much research in different disciplines (Coxhead, 2000; Fakhretdinivich Makayev, Rafailovna Baranova, & Albertovna Sigacheva, 2019; Gardner & Davies, 2014; Lei & Liu, 2016; Olga & Marina, 2019; Khany & Saeedi, 2017; Csomay & Prades, 2018; Dang, 2018; Kim & Lee, 2019; Bancroft-Billings, 2020) because it has been recognized as a crucial component in comprehension of academic discourse (Nagy & Townsend, 2012), educational success for both native and non-native learners (Webb & Nation, 2017; Shanahan & Shanahan, 2017), academic writing and academic achievement (Townsend et al., 2012; Csomay & Prades, 2018) and serves as "a badge of identity to the academic community" (Cribb & Wang, 2019. P. 1).

In the last two decades, a large number of researchers have emphasized the academic word list development for academic success. This emphasis on academic word lists indicated that academics, learners, teachers, and researchers are needed to know what has been done on word lists for academic purposes. Hence, a systematic review is needed to summarize what has been done on the academic word list Establishment. The introduction goes under the current heading.

2. Why a Systematic Review?

The systematic review informs academics, researchers, curriculum developers, professionals, teachers, syllabus designers, and learners (calling them audiences) what is known and what is unknown about studies under review, for the current study, academic word lists. Moreover, by knowing what has been done and what remains to be done, the current review helps audiences to not repeat the previous studies. This can save audiences time and energy by not spending time finding the related literature and can lower the audiences' burden for finding the gaps. The current systematic review tries to identify the gaps and takes steps towards filling these gaps in academic word list establishment. Also, through the present systematic review, the contradictory findings in academic word lists can be revealed. All of these can make

progress in the scope of academic word list development. A large number of researchers have emphasized the academic word list development for academic success (Khany &Saeedi, 2017; Coxhead, 2000; Khani & Tazik, 2013 among others). This emphasis on academic word list development has indicated that academics, learners, teachers, and researchers are needed to know what has been done on word lists for academic purposes. Hence, a systematic review is needed to summarize what has been done on the academic word list Establishment. The introduction goes under the current heading.

Because reviews are significant methods for obtaining the "bottom line" about what works and what doesn't (Uman, 2011), the current study was conducted to identify what has been done and what remains to be done on academic word lists, the main themes, and sub-themes of research on academic word lists, and the applications and implications of research on academic word list establishment. So, this systematic review seeks to address the following exploratory research questions:

1. What types of research have been done on academic word lists published between 2000 and 2020?
2. What are the main themes and sub-themes of research on academic word lists published between 2000 and 2020?
3. What are the applications and implications of research on academic word lists for language teaching and learning?

It is worth noting that by academic word lists, we mean every type of word list developed for academic purposes.

3. The Background of the Study

The demand for academic English achievement and instruction has led to the development of different types of curricula such as English for Specific Purposes (ESP), English for Specific Academic Purposes (ESAP), English for Academic Purposes (EAP), and English for General Purposes (EGP). Accordingly, this has led to the development of different word lists based on curriculum purposes with different terminologies including semi-technical vocabulary (Farrel, 1990), cryptotechnical (Fraser, 2007), and opaque (Todd, 2017). In the current study, we prefer to adopt three broad terminologies including Core (also known as general or basic) Word Lists (CWLs), General Academic Word Lists (GAWLs), and Discipline-Specific Academic Word Lists (DSAWLs). One of the advantages of this broad word list classification is that each classification can function as an umbrella term that includes every type of word list with different terminologies.

It is worth noting that this type of word list classification does not mean that every word belongs to one of these three classifications. But, a word can be classified as a core word in one context or as a discipline-specific word in another context. This means that this is the surrounding context of the word that can identify the word classifications. Figure 1 indicates the relationship between CWL, GAWL, and DSAWL.

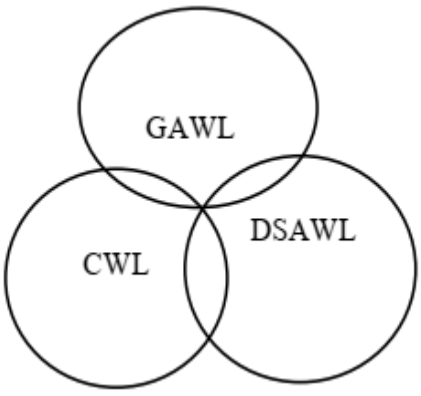

Figure 1. Word Lists Relationship

3.1. Core Word Lists (CWL)

Though CWLs are not the focus of the present study, it is required to represent some information about them because the academic wordlists were sometimes differentiated by excluding CWLs. Paquot (2010) defines core

vocabulary as "a core (or basic or nuclear) vocabulary consists of words that are of high frequency in most uses of the language (P.10)". Before the development of the influential General Service List (GSL) (West, 1953), different CWLs were developed (Thorndike, 1921; Palmer, 1931; Faucett & Maki, 1932). However, GSL has been the most influential (Todd, 2017) and well-known (Paquot, 2010) wordlist serves as a basis for the development of Coxthead's (2000) academic word list and some other today's word lists (Xodabande & Xodabande, 2020). As an influential CWL, however, GSL was criticized from different points of view including the age of the list (Read, 2000) and different principles in word compilation (Brezina & Gablasova, 2015). Moreover, GSL is only based on written corpora and does not include spoken ones. Raising these criticisms by different researchers has led to the development of different CWLs (Brezina & Gablasova, 2015; Browne, 2013; Nation, 2012, 2006).

3.2. General Academic Word Lists (GAWL)

General academic vocabulary is defined as "items that have high frequency, wide range, and even distribution in a corpus representing materials from different academic subject areas (Dang, Coxhead & Webb, 2017. P.5)". GAWs were not designed for specific disciplines but they were "discipline-crossing academic word lists" (Khany & Saeedi, 2017. P. 55). The creation of GAWLs dates back to the 1970s (Campion & Elley 1971; Praninskas, 1972; Lynn, 1973; Ghadessy, 1979) developed mostly from textbook corpora. Because these word lists belonged to the pre-computer age or to the time with limited use of computer programs, all of them were developed manually. Some were based on criteria such as range and frequency, (Campion & Elley 1971; Praninskas, 1972) while others were based on students' annotation (Lynn, 1973; Ghadessy, 1979). Later, Xue and Nation (1984) combined these four-word lists into one and developed the University Word List (UWL). However, UWL was criticized because of its inconstancy of methodology in the development of the list (Coxhead, 2000). With the development of computer programs, such as the Range computer program two types of GAWLs were developed.

The first influential computerized general academic word list was developed by Coxhead (2000). Coxhead (2000), using a corpus of 3.5 million running words, created a word list containing 570-word families excluding GSL. As the most influential GAWL, Coxhead's (2000) study was criticized for the use of word families (Gardner & Davies, 2014), corpus expansion (Hyland& Tse, 2007), usefulness for ESP courses (Chen & Ge, 2007), semantic and grammatical variation across disciplines (Hyland& Tse, 2007), and appropriateness for productive purposes (Paquot, 2010). The second influential academic word list is Gardner and Davies' (2014), new academic vocabulary list (AVL). Gardner and Davies (2014) developed a word list containing 3,000 lemmas from a corpus of 120 million running words. However, the assumption behind these two-word lists is different. Coxhead (2000), assuming that learners know the general high-frequency words, omitted the words on GSL and based the AWL list on the word family. On the other hand, Gardner and Davies did not have such an assumption and all of the words meeting the identified criteria were included in creating their word list and based their AVL on lemma rather than word family. Garner and Davies's (2014) study like Coxhead's (2000) study was criticized for not representing the whole spectrum of academic writing (Malmström, Pecorari, & Shaw, 2018), the suitability of the list only for some students (Durrant, 2016), the comparison method used in converging lemmas to word families (Lei& Liu, 2016), the inclusion of BNC/COCA and GSL high-frequency words (Nation, 2016, 2013), leaning too much towards American English (Simbuka, 2019), and a high number of words (Webb & Nation, 2017).

3.3. Discipline-Specific Academic Word Lists (DSAWL)

Discipline-specific academic word lists include items that are related to a specific discipline semantically and/or grammatically. For example, the words "chemical, plus, and mode" were found (Valipouri & Nassaji, 2013) as the first and most frequent word families in chemistry. DSAWL development dates back to Harlan (1926). More specifically, the DSAWLs development was the focus of many studies after the development of Coxhead's (2000) AWL specifically by the emergence of the criticisms leveled at this word list. From that time, different researchers developed different DSAWLs for a variety of specific fields of study including but not limited to: a medical word list (Quero & Coxhead, 2008), a chemistry word list (Valipouri & Nassaji, 2013), an applied linguistics word list (Khani &Tazik, 2013), a business word list (Hsu, 2011). Khany and Saeedi (2017) pointed out that "the assumption behind this is that there must be some unique features in the academic vocabulary … of one discipline (P.54)". Researchers find that discipline-specific vocabulary is among the most challenging issues for both native and non-native speakers (Wu & Hammond, 2011) and is crucial for EAP learners to develop their subject knowledge (Ha & Hyland, 2017). Related discussions, advantages, and disadvantages of DSAWL are given in the discussion section.

4. Methodology

A systematic literature review was chosen to describe, appraise, and synthesize the current research on academic word lists. To ensure that our review is systematic, we were guided by the Preferred Items for Systematic Reviews and Meta-Analysis (PRISMA) statement (Moher, et al. 2009), and carried out the following steps.

4.1. Eligibility Criteria

The eligibility criteria for the current systematic review were the followings:

- Topic of research: studies designed to create word lists – a list of words for academic purposes
- Type of research: published, peer-reviewed journal articles, unpublished theses/ dissertations, review articles, book chapters, and books that use spoken and/or written academic corpora
- Date of publication: studies published between 2000 and 2020
- Language of publication: studies written in English
- We excluded:
- Articles published in conferences, because conference papers were not peer-reviewed articles
- Book reviews
- Proceedings
- International Congresses

It is worth noting that in the case of unpublished theses/dissertations, we sent an e-mail to the authors for getting permission to use their studies. If the author did not respond to the e-mail, it was supposed that there is no problem regarding the use of the study. The contact information of some of these unpublished theses/dissertations was not available but because of the risk of bias, the researchers decided to include these studies.

4.2. Study Selection

Several keyword searches, keywords represented in Table 1, were conducted to identify the related literature. The procedure of keyword searching was conducted in different well-known databases including Elsevier, Taylor and Francis, Sage, Oxford, De Gruyter, Springer, Wiley, and John Benjamins Publishing. Furthermore, we, also, searched Google Scholar for further studies that may not have been published by the aforementioned publishers

The keyword searching was restricted to only the title of the studies and included the singular, plural, and combination form of keywords such as a ‘wordlist’ or ‘wordlists’ and ‘word list’ or ‘word lists’. This was done in line with the authors' agreement and the major theme of the study – wordlist development.

A general table was developed to save the results based on their titles. The results of the search for each database were saved with the database heading. For example, results of keyword searching for Springer were saved with the heading of Springer. The number of studies attributed to each keyword is listed in front of the database heading. During the process of saving results, titles of the study were also screened resulting in excluding some studies not focused on word list establishment. In case of any doubt, the title of the study was recorded for further analysis.

After finishing the keyword search in the well-known databases, Google scholar searching was conducted. Before saving Google scholar search results, the duplicated studies were identified and omitted from the final results. The process of initial title searching was also run for Google scholar searching, that is, studies whose titles did not focus on academic word list establishment were not recorded.

The initial search delivered 2,165 studies. During the process of initial title searching and excluding duplicate studies, 744 studies were removed. The titles and abstracts of the remaining studies (n=1,421) were assessed against the inclusion criteria. When the title and abstract screening did not suffice, the full texts were retrieved to decide whether the article met the inclusion criteria. In case of any doubt, the second and third authors were consulted. Discrepancies were solved by discussion until a 100% agreement was reached. After removing the articles, not meeting the inclusion criteria

(n=1,357), 64 word lists remained for further analysis. Among these 64 word lists, nine studies were excluded with reasons and 55 studies remained for further analysis. Moreover, a hand search of reference lists of the 55 studies provided 27 more studies. Of these 27 studies, 18 studies were excluded. And the remaining 9 studies were added to the 55 studies. In sum, 64 studies remained for quality and relevance assessment.

Table. 1. *Search Keywords for Wordlist Identification*

Word list(s) / Wordlist(s)	Vocabulary list(s)	General service list(s)	Technical vocabulary(ies)
Keyword list(s)	academic vocabulary(ies)	Words list	Academic lexis

* Boolean operator, 'OR, was used during the electronic search. The 'OR' operator was used to select one out of the search terms that should be included in the title.

4.3. Quality and Relevance Assessment

Burls (2009) has defined quality assessment as "the process of carefully and systematically examining research to judge its trustworthiness, and its value and relevance in a particular context" (p. 2). This can assist reviewers to ensure that "only the most relevant and trustworthy studies are used to develop the conclusions of the review" (Gough et al., 2009, p. 154). To do so, the 64 remaining studies were assessed based on the Weight of Evidence (WoE) framework developed by Gough (2007). In this framework, there are three key areas for assessing studies: methodological quality (WoE A), methodological relevance, and topic relevance (WoE C).

For methodological quality (WoE A) assessment, an overall rating of inadequate, low, moderate, and high, was identified. In so doing, first, a set of quality criteria including research purposes, criteria specification, data collection, data analysis, and evidence for supporting claims were identified. Based on the extent to which these criteria were met in the studies, they received a score from 0 to 3 (0-not at all met, 1-met to some extent, 2 mostly met, 3-fully met). These scores were used to identify the overall appraisal of the methodological quality (inadequate, low, medium, and high).

The methodological relevance assessment aimed to identify the extent to which the method is appropriate in word list identification. On the other hand, topic relevance sought to identify the degree to which studies provided adequate findings on word list development. Like methodological quality (WoE A) assessment, for methodological relevance assessment and topic relevance, a rating of high, moderate, low, or inadequate was identified. The appraisal of the studies was done by one of the authors. The second and the third author, respectively, appraised 25% word list studies (n=16) based on the random selection of the studies. The appraisal of the second and third authors was almost in full agreement with the first author's appraisal of the quality and relevance assessment of the studies. Inter-rater reliability was calculated for the quality assessment indicating almost perfect agreement (Kappa = 0.979).

Those studies appraised as inadequate or low in the quality of the methodology were excluded from the final list of the studies. This appraisal resulted in the further exclusion of four-word list studies. The process of the study identification is summarized in Figure 2.

4.4. Data Abstraction

The final studies (n=60) for data extraction were first numbered from 1 to 60 and saved in a separate file. For each of the research questions, a table was designed with the numbers of the studies from 1 to 60. For example, the first table comprised general characteristics of studies including author names, publishing date, publishing journal, publisher, corresponding author information, institution, publication status, and Doi. It is worth noting that some studies did not contain all of the general characteristics information, for example, some did not have Dois or contact information. However, an attempt was made to gather as much related information as possible. Also, some articles did not identify the corresponding author, for such articles, it was supposed that the first author is the corresponding author. The second table included the studies' main theme and sub-theme information. And, the third table consisted of complete information about the applications and implications of the studies.

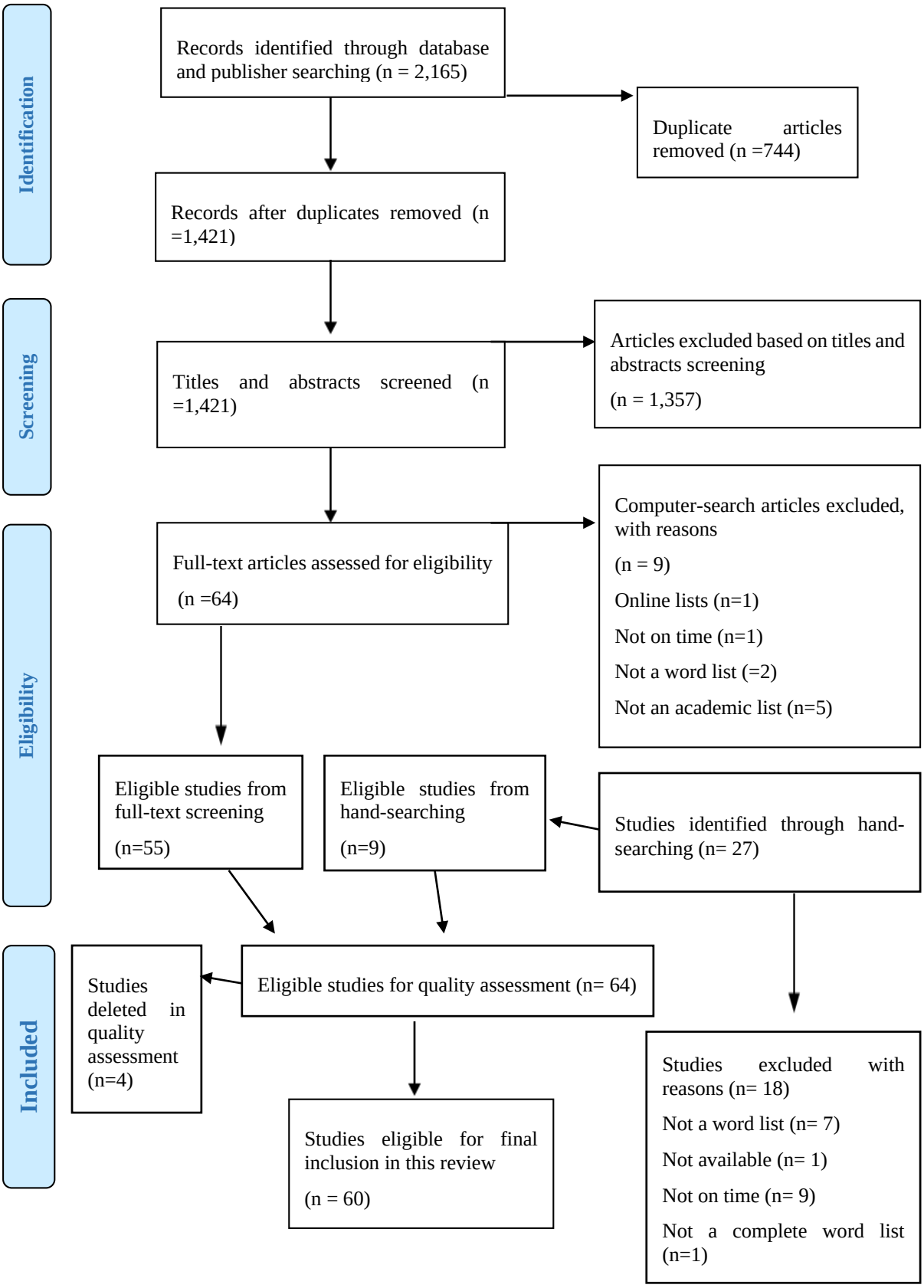

Figure 2. PRISMA Flow Diagram; Study Selection Process for Word Lists

To identify the main themes and sub-themes, first, two researchers read the full text of the studies and determined the main themes and sub-themes of each study. Second, the main themes of the studies were recorded and constantly compared to each other to identify the main themes. For example, the researchers read article number 1 and determined the main themes and sub-themes of the article. They read article number 2 and identified the main themes and sub-themes. The main theme of these two studies was compared to each other. In the case of similarity between themes, the main theme was established. The process of reading the texts and identifying the main theme and sub-theme continued. If the themes were different, new categories were created. This process of the main theme and sub-theme identification was conducted for all 60 studies.

5. Results and Discussion

Previously we classified word lists into three broad categories including core word list (CWL), general academic word list development (GAWL), and discipline-specific academic word list development (DSAWL). Since, the focus of this study was on academic word list development, excluded the CWL from the study and focused on both GAWL and DSAWL.

In total 60 studies met the pre-specified eligibility criteria and were included in the current study. As indicated in Figure 2 below, of the 60 studies, 51 (85%) studies were research articles, 7 (rounded to 12%) studies were dissertations, and 2 studies (rounded to 3%) were published as chapters. Of the 51 research articles, 17 (rounded to 33%) studies were published by Elsevier, 2 (rounded to 4%) studies were published by Wiley, 2 (rounded to 4%) studies were published by Sage, 1 (rounded to 2%) published by Oxford, 2 (rounded to 4%) studies published by John Benjamins, 27 (rounded to 53%) studies published by other journals. Among these publishers, Elsevier published more than the other publishers in way that Elsevier published 17 (28%) of the research journals, and the sum of the research articles published by Wiley, Sage, Oxford, and John Benjamins was almost 7 studies (rounded to 12%). This indicated that Elsevier was a more suitable publisher for publishing research articles than other publishers, and researchers prefer to publish their studies with this publisher. Only one study was published as a chapter in Springer. Moreover, no study was published by De Gruyter, and Taylor and Francis. It is worth noting that almost half of the studies, 28 (47%) studies, were published by other journals all around the world, for example, the Journal of Asia TEFL (Veenstra& Sato, 2018), Mextesol Journal (Kwary & Artha, 2017), Journal of English Language Teaching and Learning (Khany& Saeedi, 2017). This showed that there are several journals all around the world that are publishing academic word lists. Of the 60 included studies, 4 (rounded to 7%) studies were conducted to identify spoken academic words (Bancroft-Billings, 2020; Dang, 2018; Dang, 2018; Dang, Coxhead, & Webb, 2017). The remaining 56 (93%) studies were conducted to identify academic words for writing purposes. This showed that the focus is more on written discourse than spoken discourse. As a result, the spoken discourse was not paid enough attention and there is more space in this area to conduct research.

5.1. General Academic Word List Themes and Sub-Themes

The main theme of GAWL was to develop academic word lists for general academic purposes. Of the 60 identified studies, 10 studies (17%) focused on GAWL development including Coxhead (2000), Paquot (2007 & 2010), Gardner and Davies (2014), Hajiyeva (2015), Khany and Saeedi (2017), Dang, Coxhead, and Webb (2017), Green and Lambert (2018), Malmström, Pecorari, and Shaw (2018), and Safari (2020). Of the 10 studies, only one study focused on spoken word list development (Dang, Coxhead, & Webb, 2017). The other 9 studies, focused on word list development from written corpora. Three of the ten studies (Paquot, 2007&2010; Malmström, Pecorari, & Shaw, 2018) used learner corpora (productive corpora) for their word list development. Seven other studies focused on research articles or textbooks (receptive/expert corpora) for establishing word lists. Only one study of the ten studies (Green and Lambert, 2018) accompanied the word list with its collocations. One of the ten studies (Gardner & Davies, 2014) focused on web-based methods for learning academic vocabulary. Detailed information on the themes and sub-themes of the GAWL studies is represented in Table 2.

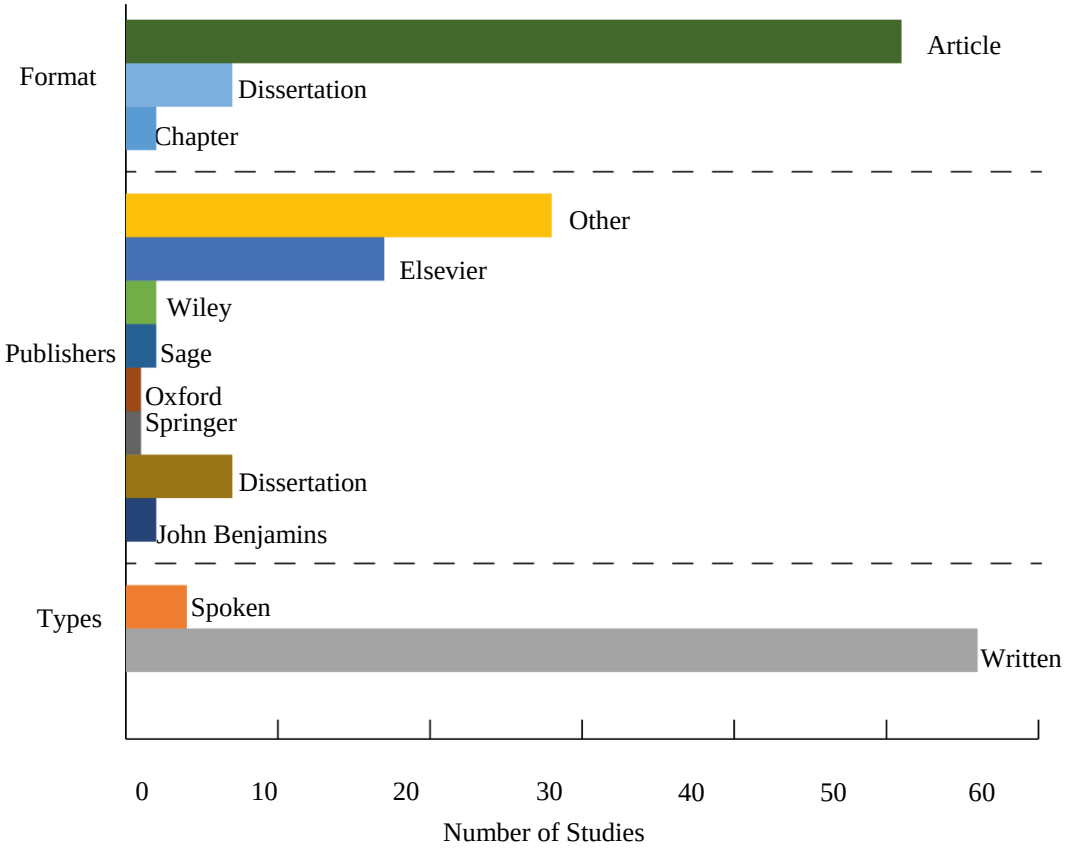

Figure 3. Summary of the Characteristics of the Included Studies

Table 2. *General Academic Word List Development Themes and Sub-Themes*

1. *Coxhead, A. (2000):* developing and evaluating an AWL based on a consistent method for EAP students
2. *Paquot, M. (2007):* using learner corpora to develop a productively-oriented academic word list, presenting a method to develop a productively-oriented academic word list
3. *Paquot, M. (2010):* using learner corpora and (semi-)automatic extraction procedure to develop a productively-oriented academic keyword list,
4. *Gardner, D., & Davies, M. (2014):* provide web-based methods for learning academic vocabularies, a lemma-based word list
5. *Hajiyeva, K. (2015):* the frequency distribution and coverage of the AWL and British National Corpus words in university textbooks of English majors, Developing a university textbooks word list for second-year English majors
6. *Khany, R., & Saeedi, M. (2017):* creating an English for Academic Purposes Word List (EAPWL) for material development
7. *Dang, T. N. Y., Coxhead, A., & Webb, S. (2017):* developing, validation, and gradation of an academic spoken word list
8. *Green, C., & Lambert, J. (2018):* developing accompanying word family and word association (i.e. collocation) lists for secondary school education
9. *Malmström, H., Pecorari, D., & Shaw, P. (2018):* comparing the academic vocabulary found in students' writing with the academic vocabulary found in published academic writing, developing a productively-oriented academic word list
10. *Safari, M. (2020):* developing a vocabulary list for EAP and conversation students, comparing the academic and conversation vocabularies

5.2. Discipline-Specific Academic Word List Development Themes and Sub-Themes

Out of the 60 selected studies, 50 studies (83%) were conducted in the domain of DSAWL. Thirteen themes were identified among these 50 studies, as represented in Table 3. As shown in Table 3, the highest number of DSAWL studies was conducted in medical disciplines (n=15, 30 % of the DSAWL studies or 25% of the total 60 studies). In addition, four main themes including medical, engineering, linguistics, and multi-disciplinary (the studies that used multi-disciplinary corpus) encompassed 70 percent of the 50 DSAWL studies. This showed that researchers focused more on these four themes. For more information about themes and sub-themes.

Table 3. *Discipline-Specific Academic Word List Development Themes*

Theme	Author(s)	% of DSAWL
Medical	Fraser, S. (2007 & 2009), Wang, J., Liang, S. L., & Ge, G. C. (2008), Mukundan, J., & Jin, N. Y. (2012), Mohamad, A. F. N., & Jin, N. Y. (2013), Hsu, W. (2013), Mungra, P., & Canziani, T. (2013), Hickey, J. et al (2015), Yang, M. N. (2015), Lei, L., & Liu, D. (2016), Murti, M. K. (2016), Kongcharoen, P. A. (2018), Quero, B., & Coxhead, A. (2018), Anis Ashraf, Z. (2018), Shirzadi, D., & Dowlatabadi, H. R. (2020)	30
Engineering	Mudraya, O. (2006), Sukhum, W. (2008), Ward, J. (2009), Zhang, M. (2013), Hsu, W. (2014), Todd, R. W. (2017), Veenstra, J., & Sato, Y. (2018)	14
Linguistics	Vongpumivitch, V., Huang, J. Y., & Chang, Y. C. (2009), Khani, R., & Tazik, K. (2013), Moini, R., & Islamizadeh, Z. (2016), Saiad, A., & Bouri, H. (2019), Kim, H. O., & Lee, H. K. (2019), Gholaminejad, R., & Sarab, M. R. A. (2020), Lee, H. K., & Kim, H. O. (2020)	14
Multi-disciplinary	Coxhead, A., & Hirsh, D. (2007), It-ngam, T., & Phoocharoensil, S. (2015), Chanasattru, S., & Tangkiengsirisin, S. (2016), Kwary, D. A., & Artha, A. F. (2017), Dang, T. N. Y. (2018a & 2018b)	12
Economics	Konstantakis, N. (2007), Hsu, W. (2011), Tongpoon-Patanasorn, A. (2018), O'Flynn, J. A. (2019)	8
Computer	Minshall, D. E. (2013), Chen, H., & Lei, G. (2019), Roesler, D. (2020)	6
Psychology	Safari, M. (2018), Xodabande, I. & Xodabande, N. (2020)	4
Chemistry	Valipouri, L., & Nassaji, H. (2013)	2
Environmental	Liu, J., & Han, L. (2015)	2
Food	Esfandiari, R., & Moein, G. (2015)	2
Islamic	Simbuka, S. (2019)	2
Legal	Bancroft-Billings, S. (2020)	2
Agriculture	Muñoz, V. L. (2015)	2

Medical

Eight subthemes have been found in medical academic word lists including pharmacology (Fraser, 2007& 2009), medicine (Wang, Liang, & Ge, 2008; Hsu, 2013; Lei& Liu, 2016; Quero & Coxhead, 2018; Anis Ashraf, 2018), nursing (Mukundan & Jin, 2012; Mohamad & Jin, 2013; Yang, 2015), medicine and surgeon (Mungra & Canziani, 2013), clinical (Hickey et al, 2015), health and life science (Murti, 2016), physical education and sport science (Kongcharoen, 2018), and health information management (Shirzadi & Dowlatabadi, 2020).

In pharmacology, Fraser (2007) focused on a pharmacology word list development outside of GSL and AWL. And in 2009, he identified the most frequently used words in pharmacology consisting of GSL and AWL.

In medicine, five researchers conducted studies with different themes. Wang, Liang, and Ge (2008) using research articles as their corpus developed a word list excluding GSL; Hsu (2013) established a medical textbook word list deleting 3000 BNC words; Lei and Liu (2016) used a mixed corpus (textbooks and research articles) and developed a word list by combining methods of Coxhead (2000) and Gardner and Davies (2014); Quero and Coxhead (2018) identified the most frequent words of medical textbooks and its integration into an ESP course, and Anis Ashraf (2018) created a word list and identified their collocations by excluding GSL and AWL from the corpus of medical textbooks. Three of these 5 studies (Hsu, 2013; Quero & Coxhead 2018; Anis Ashraf, 2018) focused on textbooks for developing word lists. One out of five (Lei & Liu, 2016) established a word list using a combination of textbooks and research articles. And, one study developed a word list out of research articles (Wang, Liang, & Ge, 2008). In medicine, the focus of the

researchers was more on medicine word list establishment from textbooks corpora indicating that the textbooks were more important for researchers to develop the word lists. Moreover, excluding CWLs as mentioned earlier was problematic.

Three researchers focused on word list development for nursing. Two studies (Mukundan & Jin, 2012; Mohamad & Jin, 2013) focused on the identifying most frequent words in nursing textbooks, and one focused on highlighting words in nursing research articles (Yang, 2015). Again, for nursing word list establishment the focus was more on textbooks. Of the 15 medical studies, only one study focused on oral vocabulary identification (Hickey et al, 2015). The remaining 14 studies focused on word list development from written corpora. Altogether, 12 out of the 15 medical word list studies were created from textbook corpora and only 3 studies were created out of research article corpora showing that researchers' attention was on textbooks. This leaves a space for establishing word lists extracted from research articles. It should be noted that textbooks included long texts often written by one author. That's why they may include writers' idiosyncrasies of writing and biases in using particular words. Thus, researchers should be careful when establishing word lists from textbooks and the corpora should include the variety of the authors to preclude the writers' idiosyncrasies. Research articles, however, do not suffer from such disadvantages because they include a variety of authors. Thus, it is recommended that researchers conduct further studies and develop wordlists for medical research articles. In this way, the findings can reach all and the readers' needs in both book and article reading will be met.

Also, it is implied that still some medical sub-disciplines are overlooked. The subfields of medicine, pharmacy, dentistry, rehabilitation studies, and health sciences have their own global communities requiring specific wordlists. Additionally, most of these studies did not take the importance of technical terms into account and this might lead to the underrepresentation of the wordlists provided. Therefore, more studies need to be done for each area of medical studies with special attention to the technical terms. Future studies can compare the medical wordlists and identify the overlapped words in the lists. This comparison will help the students and academicians to be familiar with the highest frequency words in different sub-disciplines of medical sciences.

Engineering

Fourteen percent (n=7) of the total 50 DSAWL studies focused on establishing engineering academic word lists. Mudraya's (2006) study focused on the integration of the lexical approach with a data-driven corpus-based methodology (corpus linguistic methodology) in English teaching**.** Sukhum (2008) identified technical, academic, and general vocabulary in terms of single words and complex noun phrases. Ward (2009) developed a short and non-technical word list for engineering students with little lexical or grammatical knowledge. Zhang (2013) highlighted developing and comparing semi-technical and technical vocabularies in information engineering. The focus of the Hsu (2014) studies was on 95% coverage of the texts to ensure adequate comprehension of the engineering textbooks. Todd's (2017) study emphasized words that students are likely to have problems dealing with autonomously (polysemous or opaque words). Veenstra and Sato (2018) focused on creating an engineering and science word list.

Linguistics

Seven studies of 50 studies in the domain of DSAWL (14%) were conducted on linguistics. Vongpumivitch, Huang, and Chang (2009), Khani and Tazik (2013), and Moini and Islamizadeh, (2016) created word lists from research articles. Moini and Islamizadeh, (2016) focused on the most frequently used vocabulary excluding technical words. Khani and Tazik (2013) and Vongpumivitch et al (2009) both developed word lists outside of GSL. Saiad and Bouri (2019) highlighted the academic words in the master thesis introductions. Kim and Lee (2019), Gholaminejad and Sarab (2020), and Lee and Kim (2020) attempted to develop word lists from applied linguistics textbooks. Lee and Kim (2020) focused on semantics/pragmatics in English Textbooks. Gholaminejad and Sarab (2020) drew up a list of textbook academic words (= terminology) accompanied by a list of collocations. And, Kim and Lee (2019) investigated the academic words beyond the first 2,000 words of BNC/COCA in applied linguistics textbooks.

Multi-Disciplinary

As shown in Table 3, these studies relied on different disciplines for making their corpora. Therefore, their implications are not limited to specific disciplines. That's why they were grouped under the head of multi-disciplinary. Six multi-disciplinary studies (12% of DSAWL studies) were conducted from 2000 to 2020 (Coxhead & Hirsh, 2007; It-ngam & Phoocharoensil, 2015; Chanasattru, & Tangkiengsirisin, 2016; Kwary & Artha, 2017; and Dang 2018a&b).

Coxhead and Hirsh (2007) tried to develop a pilot science word list outside of GSL and AWL using a diverse corpus of sciences. It-ngam and Phoocharoensil (2015) focused on natural science research articles to create a word list. Chanasattru and Tangkiengsirisin (2016) emphasized establishing a word list for social science using research articles as the corpora. Adopting research articles as the corpora, Kwary and Artha (2017) focused on life and social science in developing word lists. Dang (2018a) developed and validated a hard science spoken word list. Dang (2018b) created a soft science spoken word list and compared it with hard science spoken word list.

Economics

The main theme of economics included four studies. Konstantakis (2007) created a word list for teaching and understanding business texts from textbooks. Hsu (2011) attempted to establish a business word list to reach 95% lexical coverage for a reasonable comprehension of academic research article texts. Tongpoon-Patanasorn (2018) adopted a combined method (Keyword Analysis and a modified rating scale) to create a frequent technical word list for Finance. And, O'Flynn (2019) developed an Economics academic word list from the research article corpora and created a website for teaching-learning it.

Computer

The main computer sub-theme encompassed three studies with different sub-themes. Minshall (2013) focused on the establishment of a technical vocabulary and multi-word list of computer science from research articles. Chen and Lei (2019) developed a word list by the methods of computer-based analysis and the rating scales (a hybrid method) by adopting research articles as the corpora. And, Roesler (2020) attempted to create a lemma-based computer science academic vocabulary list from research articles and textbook corpora. Undoubtedly, the area of technology is rich enough for developing recurrent studies. The updated wordlists are useful for different researchers working in this area.

Psychology

Only two researchers focused on developing psychology word lists. Safari (2018) developed a classified word list including AWL, GSL, and non-AWL/non- GSL list of words from research articles in Psychology. Xodabande and Xodabande (2020) identified the AWL and its coverage and a non-GSL/AWL academic vocabulary based on Psychology research articles.

Chemistry, Environmental, Food, Islamic, Legal, and Agriculture

Chemistry, environmental, food, Islamic, legal, and agriculture each included only one study. Valipouri and Nassaji (2013) attempted to create a chemistry word list. They identified the similarity and the difference between the chemistry word list and the current well-known GSL and AWL. Categorizing the words into AWL, GSL, and non-AWL/non- GSL list is the advantage of the list which can help learners and teachers in learning and teaching as explained earlier.

Liu and Han (2015) developed an environmental academic word list and tested its validity from research articles corpora. The advantage of this study is testing the validity of the list resulting in a more valid list of words.

Esfandiari and Moein (2015) focused on creating a list of the most frequently occurring academic words in food science and technology from research articles corpora. The focus of these three studies (Esfandiari & Moein, 2015; Liu & Han, 2015; Valipouri & Nassaji, 2013) was on research article corpora which leaves a gap for investigating the word lists from textbooks' corpora.

Simbuka (2019) established an Islamic religious technical vocabulary list and demonstrated ways of applying it in developing related materials. For future word list establishment of the Islamic religion, researchers can focus on research articles. The advantage is the ways of applying the lists, practical for teaching and learning because teachers and curriculum developers should know how to use such lists.

Bancroft-Billings (2020) focused on identifying and describing spoken technical Legal vocabulary within one contract course and comparing qualitative (consulting a subject specialist) and quantitative methods (a corpus comparison method) in identifying technical words.

Muñoz (2015), using quantitative and qualitative analysis of the vocabulary, developed an Agriculture vocabulary list by adopting semi-popularization article corpora.

The systematic review of the themes and sub-themes of GAWL and DSAWL studies has shown that most of these studies focused on word list development from written corpora. It might more likely indicate that spoken corpora are 1) more difficult to obtain, and b) more difficult and time-consuming to transcribe Moreover, researchers have different conceptions of academic words. In other words, we can find that there is no agreement among researchers regarding what constitutes academic words at least for two reasons. First, different researchers established different GAWLs (n=10) or DSAWLs in a specific field, for example, different word lists for nursing or applied linguistics students. Second, though most of the GAWL studies (seven out of ten) focused on expert corpora (published articles and textbooks) some other studies (three out of ten) focused on learner corpora for word list development. These reasons indicate that there is a debate among different researchers in defining academic words.

5.3. Applications and Implications of the Studies

Different researchers have written a variety of applications and implications for their studies. To be manageable, a thematic analysis was conducted to identify the main theme and categorize these applications and implications. Nine main themes were found from the thematic analysis of the study's applications and implications. These studies can be used for (1) goal setting or can help (2) material development/designers, (3) teachers, (4) learners, (5) researchers, (6) translators, (7) test developers, (8) syllabus designing/ designers. Moreover, some researchers had some (9) suggestions for how to use word lists. Each of these main themes includes a variety of sub-themes. For brevity, we confined our results to some of these sub-themes.

In goal settings, academic word lists can help ESP teachers to set vocabulary goals, enable learners to determine vocabulary goals for independent study, and set goals for EAP/ ESP courses. Material development and designers can also benefit from these word lists development by focusing on relevant vocabulary, and developing textbooks, and dictionaries. Academic word lists can help teachers to know which words are worth teaching, understand learners' language, and raise students' awareness of the commonly-used vocabulary. In addition, academic word lists can help learners to enrich language experiences, raise language awareness, and to develop field-specific words. Also, researchers can benefit from the applications and implications of academic word lists to study the words' behavior and nature of academic words. Academic word lists can also help translators in translating academic textbooks and research articles. Test developers benefit from the findings of academic word list studies in testing language proficiency. The results of academic word lists are also beneficial to syllabus designing/ designers. These word lists can serve as a reference for designing an English lexical syllabus, and as a guide for syllabus designers to focus on the most relevant and useful vocabulary in course syllabus designing. Finally, some researchers have suggested ways of using these word lists by learners including the use of context, reading academic texts with highlighted academic words, using academic words in their writing, and paying attention to collocations.

5.4. Some Challenges Found in Word List Development

Despite lots of studies in the domain of academic vocabulary and its necessity for making progress in academic achievement, academic word list development is challenging for researchers.

The first challenge among researchers is the academic vocabulary itself. The literature indicates that there is no agreement among researchers on how to define academic words. It means that researchers have different conceptions of academic words. This can be confirmed by using different terminologies for word lists: semi-technical vocabulary (Farrel, 1990), cryptotechnical (Fraser, 2007), and opaque (Todd, 2017). Moreover, creating different word lists for almost the same purpose. For example, 10 different GAWLs were developed among them – two well-known ones are Coxhead (2000) and Gardner and Davies (2014) with different word conceptions. Word conception differences can also be found in DSAWLs in a specific field, for example, different word lists for nursing or applied linguistics students. In addition, though most of the GAWL studies (seven out of ten) focused on expert corpora (published articles and textbooks) some other studies (three out of ten) focused on learner corpora for word list development. These reasons indicate that there is a debate among different researchers in defining academic words and what constitutes academic words.

Furthermore, this systematic review indicated that most of these studies focused on word list development from written corpora. This might be due to the following reasons 1) researchers may believe that word list development for academic reading comprehension is more important than word list development for spoken academic comprehension 2) spoken corpora are more difficult to obtain, and 3) spoken corpora are more difficult and time-consuming to transcribe.

Another challenge is criteria such as the unit of word counting that is different in different studies, Coxhead (2000) used word family, Lei and Liu (2016) used lemma, Khani and Tazik (2013) used word type as the unit of word counting in their studies.

Moreover, what should be included or not included in the word list is also debatable among researchers. For instance, some word lists use GSL and or AWL as stop-word lists, and deleted these words from their final lists (Yang, 2015; Coxhead & Hirsh, 2007), while others have different views and retain all of the words meeting specific criteria (Tongpoon-Patanasorn, 2018).

Corpus is also a matter of debate among researchers. There are some word lists developed only from research articles (Valipouri & Nassaji, 2013) or textbooks (Kim & Lee, 2019), or a combination of research articles and textbooks (Dowlatabadi & Shirzadi, 2020).

6. A Discussion of Gaps Found in Academic Word List Development During the Last Two Decades

The purposes of the current study were to identify (1) the academic word list development from 2000 to 2020 (2) the themes of these studies and (3) the applications and implications of them. The examination of the identified studies highlighted several weaknesses and gaps that can be considered for future studies. First, there are a large number of academic word list studies created from written corpora. But, the number of spoken academic word lists is too few. Hence, future studies can focus on spoken word list development. Second, there are only three studies that focus on learner corpora. Researchers can investigate learner corpora for developing both GAWL and DSAWL. Third, with two exceptions, all of the studies focused on single academic words. Future studies can investigate the collocation lists of the current word lists. Fourth, there are lots of disciplines whose word lists were not investigated, e.g., History. So, future studies can focus on developing word lists for these disciplines. Fifth, too few studies focus on the integration of the findings into learning and teaching models. Future studies can integrate the findings of the current studies into available learning and teaching models such as the four strands (Nation, 2007). Sixth, researchers can also focus on developing ways to appraise and validate these academic word lists. Moreover, future studies can investigate the existence of a core methodology for developing academic word lists. The existence of a core methodology can help researchers to create core word lists. One important finding from this systematic review is that, with some exceptions, all the identified word lists focused on native/expert-speaker/writers' academic corpora. In other words, no study was conducted on non-expert/native-corpora. The question is "are these academic word lists equally appropriate for native and non-native speakers/writers?". Paquot (2010) stated that EFL students' writing includes linguistic features that differ from native-speakers writing. Hence, comparative studies are needed to answer this question.

7. Advantages and Limitations of the Current Study

The current systematic review has several advantages. First, this is the first study that systematically reviews the available academic word lists. This systematic review informed the researchers about what has been done on academic word list development during the last two decades and what remained to be done. For example, there are some disciplines, such as Physics, which were not investigated for developing word lists. Thus, researchers, by knowing what has been done or what disciplines' word lists were established, can attempt to conduct studies in which their word lists were not established. Second, gaps in the academic word lists were identified by this systematic review. Hence, researchers can focus their attention on filling these gaps. However, this systematic review has its limitations. The present systematic review is confined to the thematic analysis of themes and sub-themes of academic word lists. Future studies can be conducted on a systematic review of the academic word lists methodology, for example. Moreover, we focused on academic word lists and excluded other word lists such as CWLs or newspaper word lists, for example. Future systematic reviews can investigate more different types of word lists. We also limited the current study to 20 last years, more time spans can be considered in future studies by researchers.

8. Conclusion

The present study tried to systematically review the academic word lists from 2000 to 2020. In the current study, we identified (1) the academic word lists from 2000 to 2020, (2) their themes and sub-themes, and (3) their applications and implications. The findings of this systematic review enable a profound understanding of academic word lists for researchers, teachers, and learners. Findings indicated that most of the researchers were interested in developing academic word lists from written corpora. This could be related to the accessibility and popularity of the written corpus among academicians. In addition, different researchers have developed different academic word lists even for the same discipline. This revealed the disagreement among researchers regarding what constitutes academic word lists. In other words, different researchers have different conceptions of academic word lists. Also, the emergence of new findings in the areas of technology, education, and linguistic studies has led to the renovation of wordlist development by combining different areas within a holistic corpus. The findings of such studies are useful for interdisciplinary studies. In fact, the developers have a holistic view of the sciences and believe that the borders of sciences are thin and should be overcome.

As it was discussed above, some researchers developed discipline-specific wordlists, aiming at equipping the community members of these fields with the most frequent academic words used in different sources, i.e., written, spoken, books, research articles, etc. The developers noted that this specificity of wordlists was in line with the expansion of scientific subfields and the specificity of their literature. Some other researchers, however, crossed the borders and extracted their wordlists from a mixed-corpus. They noted that the disciplines are connected closely and users (students, researchers, readers, etc.) should have broad academic knowledge useful for understanding global knowledge trends. Both groups presented their wordlists and justifications. A gap here is a meta-analysis of what has been done and the claims presented. Therefore, the main conclusion of this study is that the area of developing academic wordlists still needs to be studied deeply, and meta-analysis and comparative studies are prioritized in this area.

Author Contributions

All the authors contributed to the study's conception and design. The first author wrote the first draft of the manuscript, and all the authors commented on the previous versions of the manuscript. All the authors read and approved the final manuscript.

Conflict of Interest

The authors declare that there is no conflict of interest.

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