

Co-Occurrence and Co-Authorship Analysis in Vocabulary Acquisition

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ABSTRAK

Studi ini bertujuan untuk mengeksplorasi status publikasi saat ini pada tahun tersebut, kata kunci dari hotspot penelitian, co-occurrence dari kata kunci, dan co-authorship. Dianalisis total 1.494 referensi yang diunduh dari Scopus. Perangkat lunak VOS-viewer digunakan untuk analisis. Banyak hasil mengenai tren tahunan, distribusi kata kunci, kemunculan bersama kata kunci dalam sepuluh kelompok, penulis bersama negara dan lembaga, publikasi terkait VA yang paling banyak dikutip, juga referensi dan kutipan bersama jurnal disajikan dalam makalah ini. Studi ini menunjukkan status perkembangan dan tren dalam akuisisi kosakata. Ini dapat membantu orang dan peneliti akademis untuk mendapatkan pemahaman yang komprehensif tentang penguasaan kosakata. Ini juga memiliki nilai referensi untuk penelitian dan penerapan metode visualisasi akuisisi kosakata (VA).

Kata Kunci: *Co-kejadian, Penulisan bersama, Akuisisi kosakata.*

ABSTRACT

This study aims to explore the current status of publications in the year, the keywords of research hotspots, the co-occurrence of the keywords, and the co-authorship. It is analyzed a total of 1.494 references which were downloaded from the Scopus. The VOS-viewer software is used for the analysis. Many results regarding the annual trends, the keywords distribution, the co-occurrence of keywords in ten clusters, the country and institute co-authorship, the most cited VA associated publications, also the reference and journal co-citation are presented in this paper. This study shows the development status and trends on vocabulary acquisition. It can help people and the academic researchers to get comprehensive understanding about the vocabulary acquisition. It also has reference values for the research and application of the vocabulary acquisition (VA) visualization methods.

Keywords: *Co-occurrence, Co-authorship, Vocabulary acquisition*

INTRODUCTION

The increase in research outputs in the last twenty years has given rise to a growing interest in bibliometric analysis. Bibliometric is now being used to evaluate academic outcomes quantitatively. It provides coherent accounts of the trends in a large body of research that could in any other case be intractable. A research trend is as the collective action of a group of researchers, each of which begins to pay considerable attention to a specific scientific topic: read scientific publications on this topic, refer to them, and publish the results of their own research (Liu, et al, 2017). Analyzing research trends can be done in any scope. One of them is vocabulary acquisition.

Vocabulary acquisition refers to an essential part of the communication of meaning (Laufer, 2001) and of mastering language (Pigada & Schmitt, 2006). True vocabulary acquisition development needs more than the ability to define word or derive basic meanings of words from context. According to Rupley, Logan, and Nichols (1998), vocabulary acquisition requires the ability to discuss, elaborate, and use multiple contexts to demonstrate a clear understanding of word meanings. Vocabulary acquisition acts as the deepest process of acquiring, which involves reasoning, perception, memory, and also storage of words. It is gained while reading and it is in the form of the score of the vocabulary test that covers spelling, part of speech, word meaning and word production (Herdina et al., 2022).

Many researchers have conducted research on vocabulary acquisition. Henriksen (1999) investigated about dimensions of vocabulary acquisition, namely labeling, packaging, and network

building. Moore (2002) presented that vocabulary acquisition comes from teacher explanation and repeated listening to stories. Vocabulary acquisition is also possible from storytelling (Mason, 2005). Vocabulary acquisition through multimedia-enhanced computer-assisted word acquisition program, called CAVOCA (Constantinescu, 2007). The most effective learning tool of vocabulary acquisition is vocabulary notebook (Bozkurt and Walters, 2009). From 1999 to 2009, it can be seen that the trends of research on vocabulary acquisition are viewed from the element and strategy. Even though there are still many interesting things related to vocabulary acquisition that can be studied more deeply.

In this case, bibliometric analysis can be used to assist in identifying the year of publication, the number of publications that have been carried out in that year, the distribution of keywords, the co-occurrence, and also the co-authorship. The results of the identification can be reviewed so that further research trends in vocabulary acquisition can be seen, both those that are often studied and those that are rarely studied. The results of the review of these trends can then be taken into consideration by researchers to conduct the latest research related to vocabulary acquisition, both interdisciplinary and multidisciplinary.

METHOD

The data involved in this research were retrieved from Scopus database on 15th February 2022. Scopus database fosters the easy discovery of research and enables researchers to claim their work, ensuring proper accreditation, and supporting career development. It is one of the most comprehensive bibliographic sources available, and provides users an online access port to a number of resources, including massive citation database. Scopus offers comprehensive author and institution profiles, obtained from manual curation, ensuring high precision also recall.

For the purpose of this research, it is interested in exploring the trends of research through the year and number of publications in the year, the keywords of research hotspots, the co-authorship, the co-occurrence of the keywords associated with “vocabulary acquisition” and use “vocabulary acquisition” as the search term in the Scopus database, the literature type is defined as “article.” These data then were processed through science mapping.

Science mapping refers to essential procedure of bibliometrics (White & McCain, 1990). It can represent the discipline situation and development status (Garousi, 2016). There are many applications for bibliometrics analysis, one of them is VOSviewer. It is supported by the Centre for Science Technology Studies of Leiden University. VOSviewer was used to make visualization mapping in this paper. VOSviewer is effective in information visualization. It is used to obtain the quantitative and visual information in specific fields. VOSviewer is as free software developed by Eck and Waltman (Eck and Waltman, 2010). It has a powerful function in co-occurrence.

RESULTS AND DISCUSSION

In this part, it is presented the results of this research in details. The current status of vocabulary acquisition study is conveyed in Section 3.1. Section 3.2 introduces the keywords analysis of the research hotspots on vocabulary acquisition. The co-occurrence and co-authorship analysis are displayed in sections 3.3 and 3.4.

A. The Current Status of Vocabulary Acquisition (VA)

In this part, it is discussed the annual trends of vocabulary acquisition-related publications.

a) The Annual Trends of VA-Related Publication

Figure 1 plots the annual trends of VA-related publications. Since the first article was published in 1996, the VA-related research obtained very slow increase in the following 20 years. Until 2009, especially after 2011, more scholars started to research in this field. This led to a jump in the number of publications. There are many reasons for the rapid growth. Firstly, with the rapid development of internet technology, people were more likely to obtain massive vocabulary acquisition data. Nevertheless, there were a decrease publication of vocabulary acquisition in in 2014 - 2016. This decrease was not too high, only 2,17 %. It might happen due to some researchers were not too interested in conducting VA or even they had difficulties in determining scope of discussion and the relevant theoretical basis of VA. Meanwhile, the publications of VA publications have increased significantly again from 2017 to 2021. This increase could occur because more researchers were finally interested in VA after attending seminars/workshops related to VA or even looking for several article publications on internationally reputed journal sites such as Scopus, Web of Science, Science Direct, and others.

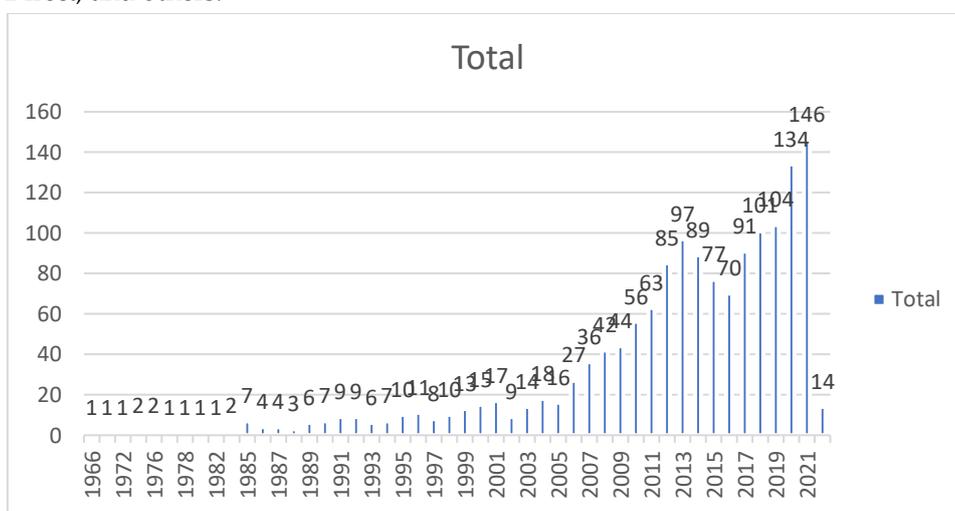


Figure 1. The annual trends of VA-related publications.

B. The Keywords Analysis of VA Related Publications

In this part, it is studied the content by analyzing the distribution of keywords: the keywords co-occurrence network map, the top 10 keywords in VA publications, and the keywords density visualization map. Keywords co-occurrence can effectively reflect the research hotspots in the discipline fields, providing auxiliary support for scientific research (Li et al, 2016). In all the 1494 VA-related publications, it is obtained 88 keywords altogether. The keyword co-occurrence network of VA (see Figure 2) was constructed by the VOSviewer software. The size of the nodes and words in Figure 2 represents the weights of the nodes. The bigger the node and word are, the larger the weight is. The distance between two nodes reflects the strength of the relation between two nodes. A shorter distance generally reveals a stronger relation. The line between two keywords represents that they have appeared together. The thicker the line is, the more co-occurrence they have (Gue et al, 2017). The nodes with the same color belong to a cluster. VOSviewer divided the keywords of VA-related publications into 10 clusters. The keyword “vocabulary acquisition” has a highest frequency of 330. Other keywords with a high frequency include “vocabulary” (120), “vocabulary learning” (53), and “incidental vocabulary acquisition” (47).

The link strength between two nodes refers to the frequency of co-occurrence. It can be used as a quantitative index to depict the relationship between two nodes (Pinto et al, 2017). The total link

strength of a node is the sum of link strengths of this node over all the other nodes. The node, “vocabulary acquisition”, has thicker lines with “vocabulary”, “reading”, “word learning”, “vocabulary learning”, “incidental vocabulary acquisition”, “incidental learning”, “language learning”, “second language acquisition”, and “reading comprehension”. The relationship among “vocabulary acquisition”, “vocabulary”, “reading” imply the components in vocabulary acquisition. The relationship among “vocabulary acquisition”, “word learning”, “vocabulary learning” represent other names of vocabulary acquisition. The relationship among “vocabulary acquisition”, “incidental learning”, “language learning”, “second language acquisition” infer the domain knowledge of vocabulary acquisition. Meanwhile, the relationship between “vocabulary acquisition” and “reading comprehension” imply one of the strategies in vocabulary acquisition. The top 10 keywords with their frequencies and total link strengths are shown in Table 1.

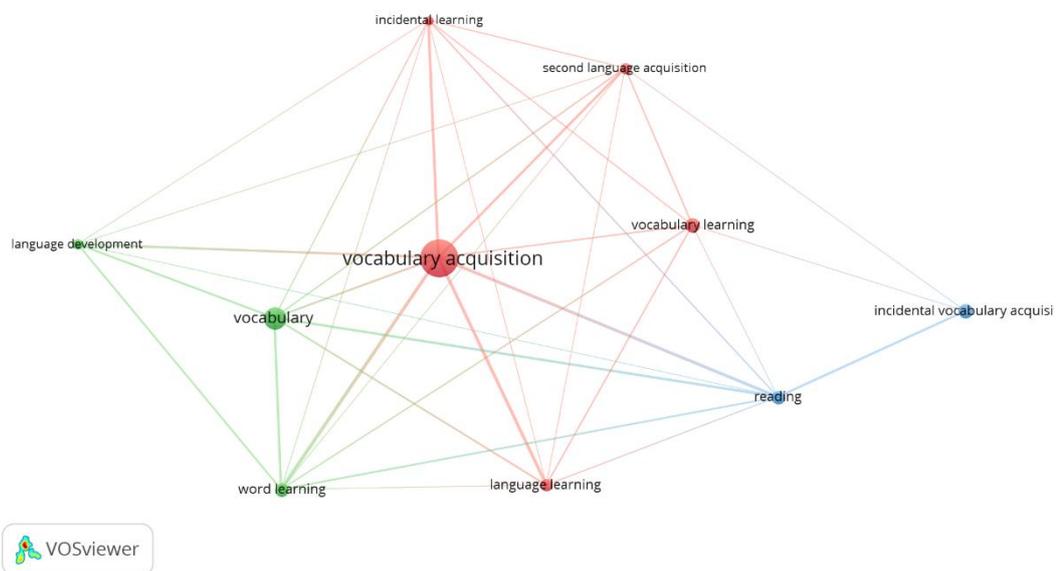


Figure 2. Keywords co-occurrence network of VA-related publications.

Table 1. The top 10 keywords of the VA-related publications.

Rank	Keywords	Frequency	Total Link Strength
1	Vocabulary acquisition	330	327
2	Vocabulary	120	131
3	Vocabulary learning	53	57
4	Incidental vocabulary acquisition	47	53
5	Word learning	42	62
6	Reading	42	90
7	Language learning	34	44
8	Second language acquisition	29	38
9	Reading comprehension	22	35
10	Incidental learning	21	47

VOSviewer can make density visualization (see Figure 3). Each node in the keywords density visualization plat has a color that relies on the density of items at that node. In other words, the color of a node depends on the number of items in the neighborhood of the node. The keywords in purple color area appear more frequently; on the contrary, the keywords in yellow color area appear less frequently. Density views are very useful for understanding the overall structure of a map and drawing attention to the most important areas in the map (Chawla et al, 2013). From Figure 3, it can be seen the research focuses of VA study intuitively: “vocabulary acquisition”, “vocabulary”, “vocabulary learning”, “incidental vocabulary acquisition” turn out to be important. These keywords are the core keywords in the VA study.

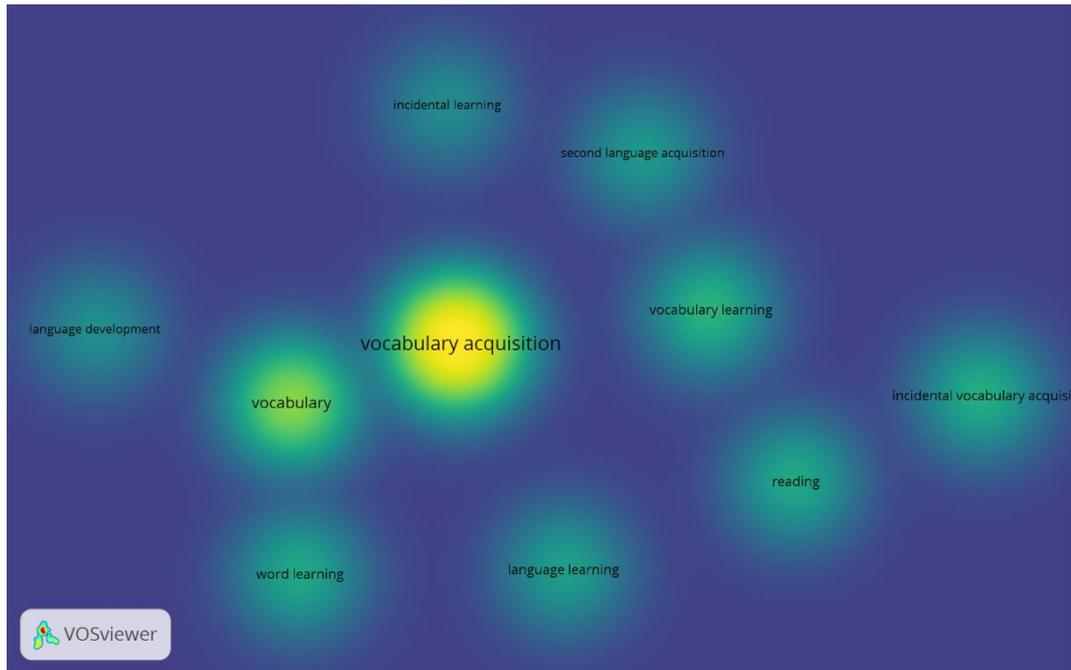


Figure 3. Keywords density visualization map of VA-related publications

C. The Co-Occurrence Analysis on VA

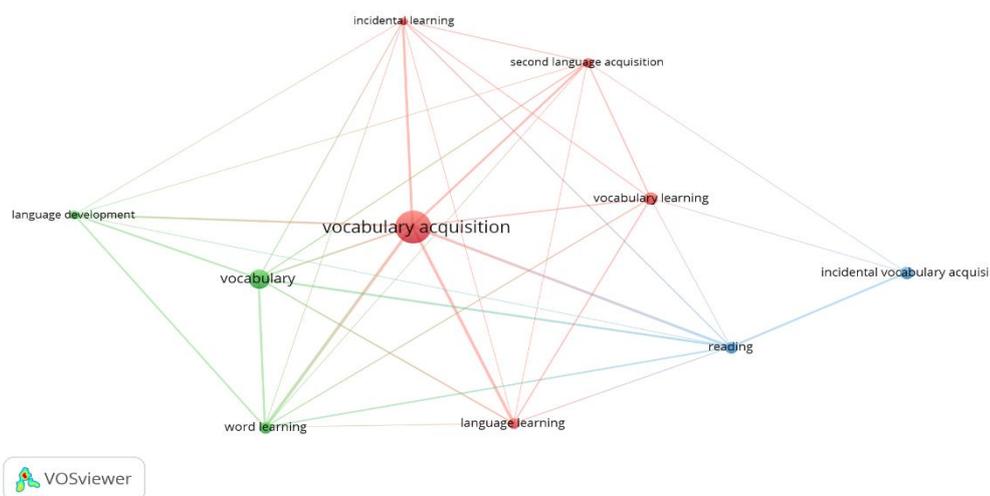


Figure 4. Co-Occurrence in Three Clusters of VA-related publications

Co-occurrence analysis has been used to study conceptual work in different domains by many researchers. In this part, it is presented co-occurrence analysis VA-related publications by considering the relationship of vocabulary acquisition with two or three most relevant keywords in three clusters.

Cluster 1 is centered on vocabulary acquisition. The most relevant keywords in this cluster are “second language acquisition” and “incidental learning”. Vocabulary acquisition is known as second language acquisition. Vocabulary acquisition as second language acquisition is as the process by which people learn vocabularies in another language after the acquisition of the first language (“mother tongue”). L2 vocabulary acquisition is different from L1 vocabulary acquisition because an L2 learner has already developed a conceptual and semantic system linked to L1. Besides, vocabulary acquisition can be developed through incidental learning. Incidental learning is as the specific circumstances that allow learners to acquire vocabulary through incidental means such as engaging of vocabulary acquisition through mental comprehension and the strategies that can be used to promote and enhance the retention of vocabulary through incidental learning (Ramos, 2014).

Cluster 2 emphasizes vocabulary. The most appropriate keywords in this cluster are “vocabulary learning”, “word learning”, and “language learning”. Vocabulary is part of vocabulary learning, word learning, and language learning. It is important part in language learning. The meanings of new words are very frequently emphasized. It is set of words within a person’s language. It is developed with age, serves as a useful and fundamental tool for communication and acquiring knowledge. It is crucial to be mastered by the learner in order to understand the language

Cluster 3 lies on incidental vocabulary acquisition. The most correlated in cluster 3 are “reading” and “reading comprehension”. Incidental vocabulary acquisition is the process of acquiring various vocabularies through incidental strategy, namely reading. When people read attentively, they read very easy, enjoyable books to build their reading speed and fluency. Another way to say that people learn to read by actually reading rather than examining texts by studying the vocabulary, grammar and phrases. The ability to read text, process it, and understand its meaning, known as reading comprehension.

D. The Co-Authorship Analysis on VA

It is difficult for a person to complete research on a certain subject individually. Many research certainly need collaborative strength to complete. Co-authorship is an important content in bibliometrics and the level of research collaboration is an index to assess the current status of research in a specific field (Reyes et al, 2017). In this part, it is mainly presented the country co-authorship, the institute co-authorship, and the highly cited VA-related publications.

a) The Country Co-Authorship Analysis

Country co-authorship is very important form of co-authorship analysis. It can consider the degree of communication between countries as well as the influential countries in this field. The country co-authorship network of VA-related publications is showed in Figure 5. The big nodes indicate the influential countries. In this respect, the top ten influential countries are United States, United Kingdom, Canada, Spain, China, Australia, Germany, Netherlands, Belgium, France.

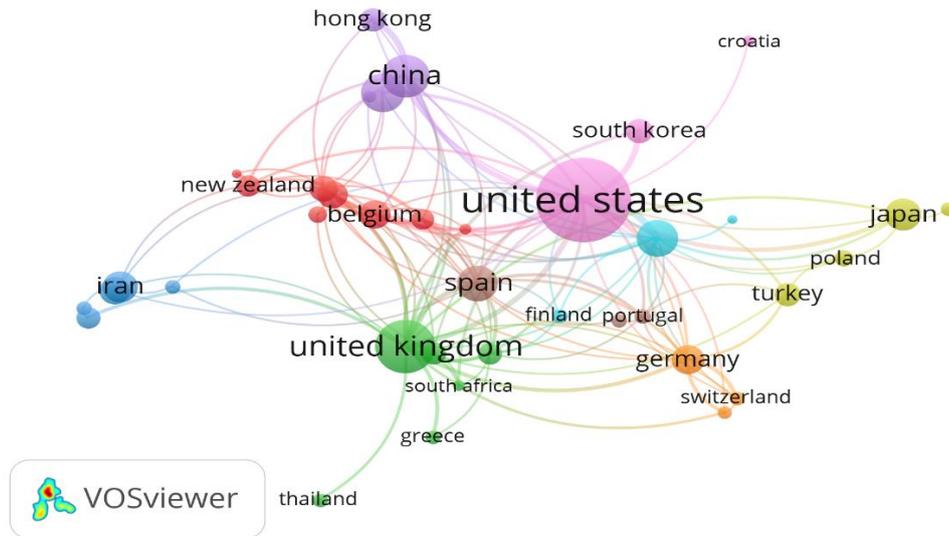


Figure 5. The country co-authorship network of VA-related publications.

b) The Institute Co-Authorship Analysis

The institute co-authorship network is shown in Figure 6. University of Ottawa from Canada, University of Nottingham from the United Kingdom, Michigan State University from United States, University of Warsaw from Poland, and University of Macau from Taipa are the top five influential institutes of the VA-related publications



Figure 6. The institute co-authorship network of VA-related publications.

c) The Most Cited VA Related Publications

To identify the most influential research in VA study, it is selected the top 10 research with the most citations. Table 2 shows the mostly cited research in terms of title, journal, authors, publication year, and citation numbers.

Table 2. The Most Cited VA Related Publications

Title	Journal	Authors	Year	Citation
Vocabulary Acquisition in a Second Language: Do Learners Really Acquire Most Vocabulary by Reading? Evidence	Canadian Modern Language Review	Laufer B.	2003	1272

Understanding vocabulary acquisition, instruction, and assessment: A research agenda	Language Teaching	Schmitt N.	2019	1015
L2 vocabulary acquisition and reading comprehension: The influence of task complexity	Investigating Tasks in Formal Language Learning	Peters E.	2006	252
Vocabulary acquisition through cloze exercises, sentence-writing and composition-writing: Extending the evaluation component of the involvement load hypothesis	Language Teaching Research	Zou d.	2017	166
The game embedded CALL system to facilitate english vocabulary acquisition and pronunciation	Educational Technology and Society	Young S.S.- C., Wang Y.- H.	2014	140
A diagonalized newton algorithm for non-negative sparse coding	ICASSP, IEEE International Conference on Acoustics, Speech and Signal Processing - Proceedings	Van Hamme H.	2013	102
Psychological cognition process of English vocabulary acquisition	Revista Argentina de Clinica Psicologica	Xie H., Wu J.	2020	93
Toward the Establishment of a Data-Driven Learning Model: Role of Learner Factors in Corpus-Based Second Language Vocabulary Learning	Modern Language Journal	Lee H., Warschauer M., Lee J.H..	2020	90
Which Elements Matter? Constructing Word Cards for English Vocabulary Growth	SAGE Open	Reynolds b. l	2020	83
The effectiveness of texting to enhance academic vocabulary learning: English language learners' perspective	Computer Assisted Language Learning	Li J., Cummins J., Deng Q.	2017	60
Can explaining less be more? Enhancing vocabulary through explicit versus elaborative storytelling	First Language	Vaahtoranta E., Suggate S., Jachmann C., Lenhart J., Lenhard W.	2018	45

The paper written by Laufer B. ranked first with 1272 citations. In this paper, the author presented that reading supplemented with a word-focused task or word-focused task without reading were shown to be more effective for vocabulary gains. The paper of Schmitt N. occupied the

second position with 1015 citations and mostly explained about development a practical model of vocabulary acquisition, vocabulary knowledge from receptive to productive mastery, lexical teaching/learning principles into vocabulary and language textbooks, extramural language exposure and how it can best facilitate vocabulary acquisition, informative measures of vocabulary knowledge, and fluency as part of vocabulary competence.

The paper written by Peters E. on the third ranking with 252 citations. The author discussed that while students who were forewarned of an upcoming vocabulary test looked up more words than students who were not forewarned of the test, test announcement affected neither word retention nor text comprehension. The paper of Zou d. was on the fourth position with 166 citations. The author explained cloze-exercises is suggested to be allocated with 'moderate evaluation' as it involves no use of chunking, hierarchical organization or pre-task planning, evaluation induced by sentence-writing with 'strong evaluation' as it involves chunking and pre-task planning at the sentence level, and evaluation induced by composition-writing with 'very strong evaluation' for it involves chunking, hierarchical organization and pre-task planning at the composition level. The paper written by Van Hamme H. was on the fifth position with 102 citations. The paper of Xie H., Wu J. occupied sixth with 93 citations. The paper written by Lee H., Warschauer M., Lee J.H. on the seventh with 90 citations. The paper of Reynolds b. l was on the eight ranking with 83 citations. The paper written by Li J., Cummins J., Deng Q. on the ninth position with 60 citations, meanwhile the paper written by Vaahtoranta E., Suggate S., Jachmann C., Lenhart J., Lenhard W. on the tenth ranking with 45 citations.

E. The Co-Citation Analysis on VA-Related Publications

Co-citation is defined as two publications which are cited together in one article (Small, 1973). It indicates that literatures cohere and such as who had shouting matches, who slept with whom, change in intelligible ways over time, whether one defines and what actually gave rise to the most significant research. The reference and the journal co-citation analysis are shown below.

a) The Reference Co-Citation Analysis

Reference co-citation analysis is very an important mean to detect the structure and evolution path of a specific domain. In the reference co-citation network, the importance of nodes does not reveal the high number of citations, but illustrates the research themes that are closely associated with VA-related research. From Figure 7, it can be found that the biggest node is Nation, i. s. p., (2001). His paper entitled "Learning Vocabulary in Another Language" published in Cambridge University Press proposed about the goals of vocabulary learning, specialized uses of vocabulary, vocabulary-learning strategies, learning words from context, word parts, testing vocabulary knowledge and use. Meanwhile, the other big nodes are Schmitt, N (2000) and Horst et al (1998). Schmitt N (2000) in his paper with the title "Vocabulary in Language Teaching" found aspects of knowing a word, incidental and explicit learning of vocabulary, and vocabulary learning strategies. Horst et al (1998) in their paper entitled "Beyond a clockwork orange: Acquiring second language vocabulary through reading" explained that a small but significant amount of vocabulary learning occurs when reading a simplified novel and having a larger vocabulary size was found to benefit vocabulary acquisition.

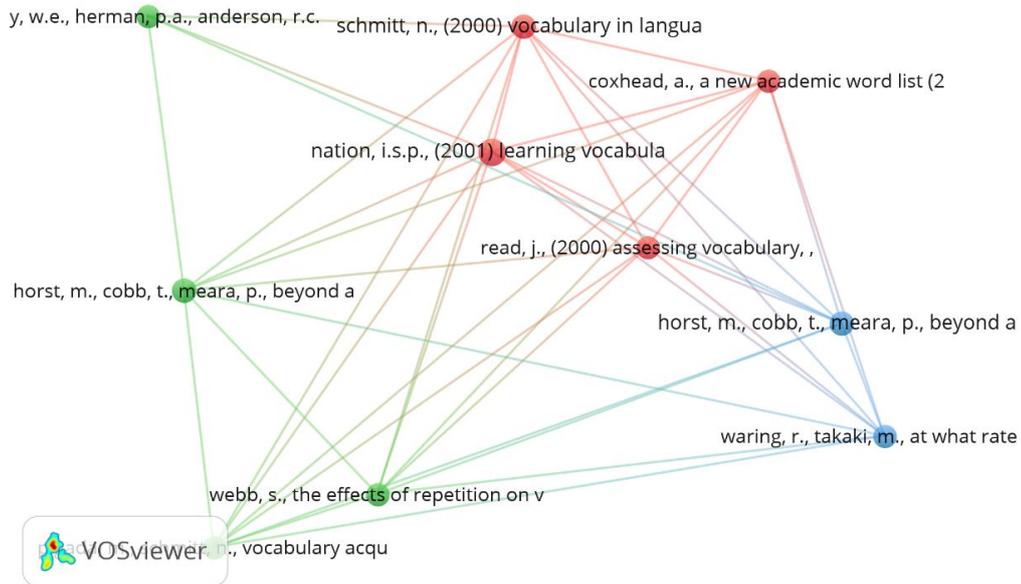


Figure 7. The reference co-authorship network of VA-related publications.
 b) The Journal Co-Citation Analysis

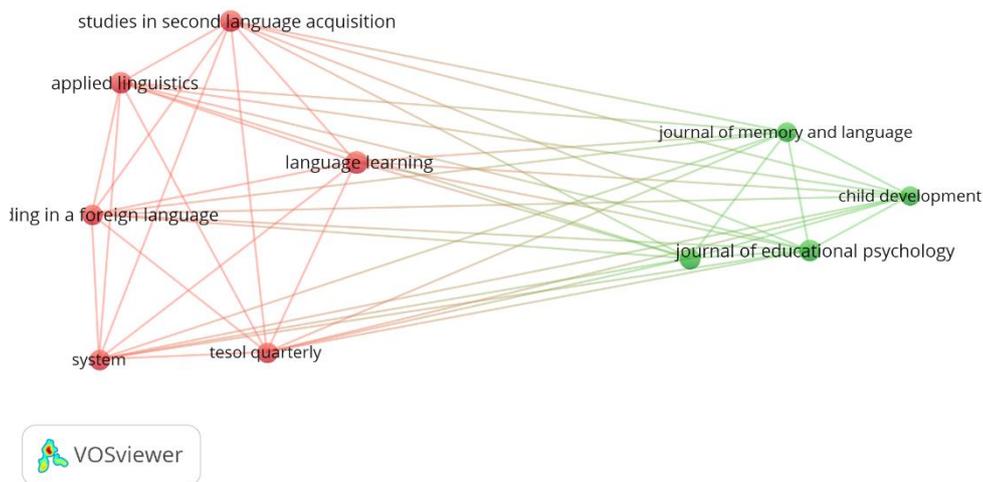


Figure 8. The journal co-citation network of VA-related publications.

The journal co-citation analysis is used to reveal the overall structure of the subject and the characteristics of a journal (Hu et al, 2006). It is used VOSviewer software to plot the journal co-citation network of VA related study. Figure 8 presents the top ten journal co-citation network of VA study. As the visualization illustrated in Figure 8, each cluster has a color that reflects the group to which the cluster is assigned. The top ten journal co-citation network are divided into two clusters. The red cluster contains applied linguistics, language learning, reading in a foreign language, studies in second language, system, TESOL quarterly. Whereas, the green cluster consists of child development, journal of educational psychology, journal of memory and language, and reading research quarterly.

CONCLUSION

It is explored some interesting results concerning the VA-related publications, which can be concluded. Firstly, VA-related publications fluctuated at low level during the periods of 1996. However, after 2017, the number of publications grown rapidly due to more researchers were finally interested in VA after attending seminars/workshops associated with VA or even looking for several publications on internationally reputed journal sites such as Scopus, Web of Science, and many more. Secondly, through the analysis of keywords, it is found that vocabulary acquisition is associated with “vocabulary”, “vocabulary learning”, and “incidental vocabulary acquisition”. Thirdly, the co-occurrence among keywords in VA-related publication in the three clusters. Cluster 1 is on vocabulary acquisition with relevant keywords: “second language acquisition” and “incidental learning”. Cluster 2 emphasizes vocabulary with appropriate keywords: “vocabulary learning”, “word learning”, and “language learning”.

Cluster 3 is on incidental vocabulary acquisition with the most correlated with keywords: “reading” and “reading comprehension”. Fourthly, the top ten country co-authorship network of VA-related publications refer to United States, United Kingdom, Canada, Spain, China, Australia, Germany, Netherlands, Belgium, France. University of Ottawa from Canada, University of Nottingham from the United Kingdom, Michigan State University from United States, University of Warsaw from Poland, and University of Macau from Taipa are as the top five influential institutes of the VA associated publications. Meanwhile, the top five cited VA associated publications written by Laufer B. with 1272 citations, Schmitt N. with 1015 citations, Peters E. with 252 citations, Zou d. with 166 citations, and Van Hamme H. with 102 citations. The most reference co-citation can be found in Nation, i. s. p., (2001) with the paper entitled “Learning Vocabulary in Another Language” published by Cambridge University Press. Meanwhile, the other frequently co-citation of reference VA are Schmitt, N (2000) and Horst et al (1998). Schmitt N (2000) in his paper with the title “Vocabulary in Language Teaching” and Horst et al (1998) in their paper entitled “Beyond a clockwork orange: Acquiring second language vocabulary through reading”. The top ten journal co-citation of VA are divided into two clusters. The red cluster refers to journal of applied linguistics, language learning, reading in a foreign language, studies in second language, system, TESOL quarterly. Meanwhile, the green cluster includes journal child development, journal of educational psychology, journal of memory and language, and reading research quarterly.

REFERENCES

- Herdina, V., Fadhilah, S. H., & Yulianti, R. (2022). The Influence of Financial Literacy and Environmental on Student Intentions for Social Entrepreneurship. *International Conference on Economics, Management and Accounting (ICEMAC 2021)*, 350–357.