❒ 819

Stemming and lemmatization in English language classrooms

Jose G. Tan, Jr.[1], Blessa Kay F. Caballero[2]
[1]College of Teacher Education and Technology, University of Southeastern Philippines, Tagum City, Philippines
[2]College of Education and Social Sciences, Mindanao State University at Naawan, Naawan, Philippines

Article Info

ABSTRACT

This study examines the pedagogical significance of linguistic features, stemming and lemmatization in enhancing vocabulary acquisition and retention in English language classrooms. It aims to provide teachers with insights that can inform and improve instructional practices. Specifically, the study addresses two key questions. Firstly, what linguistic features related to stemming and lemmatization are employed in English language classrooms? Secondly, how do these features contribute to vocabulary acquisition and retention? Using a qualitative research design, the study involved classroom observations and key informant interviews with nine teacher-participants from selected universities. The findings reveal that teachers actively integrate stemming and lemmatization as instructional tools to facilitate vocabulary learning. These techniques play a crucial role in helping students understand and retain new words. The study underscores the effectiveness of stemming and lemmatization in real-world classroom settings and highlights their value in enhancing vocabulary development. Integrating these linguistic strategies into teaching practices may optimize meaningful and effective English language learning experiences.

Corresponding Author:

Jose G. Tan, Jr.
College of Teacher Education and Technology, University of Southeastern Philippines
Brgy Apokon, Tagum City, Davao del Norte, Philippines
Email: josejr.tan@usep.edu.ph

1. INTRODUCTION

This study examined the linguistic features used in English language classrooms in relation to stemming and lemmatization. It emphasized how these features contribute to vocabulary acquisition and retention among English language learners. Mastering vocabulary and understanding word forms are fundamental elements of language learning. Morphological knowledge is crucial in reading comprehension, challenging the assumption that word-meaning knowledge alone determines reading ability. Hence, morphological knowledge significantly contributes to comprehension even when vocabulary knowledge is accounted for. There is a need to integrate morphological instruction to optimize reading development [1].

However, the complexities of the morphology of English pose a challenge for second language learners. Increasing evidence indicates that morphological skills are linked to literacy outcomes, including word reading, spelling, and reading comprehension. Despite this evidence, the precise ways in which morphology influences the development of literacy skills remain largely underspecified in theoretical models of reading and spelling development [2]. Some late learners achieve proficiency similar to native speakers; however, this is not typical since acquiring morphology in a second language remains an enduring challenge.

In response, the linguistic features of stemming and lemmatization unravel the intricacies of English vocabulary in pedagogical approaches. Stemming and lemmatization are two indispensable features yet

distinct in reducing inflectional and derivational forms of a word to a common base form. They improve the effectiveness and efficiency of language analysis in the context of English language instruction.

However, stemming and lemmatization differ in context. Stemming involves stripping words down to their stems. It is defined as the process which produces variants of a root or base word. It reduces a base word to its stem word. Stemming is essential in natural language processing due to the ability to minimize word variations to fundamental forms [3]. On the other hand, lemmatization is the process of assembling the inflected parts of a word and reducing an inflected word to its base or dictionary form such that they can be recognized as a single vocabulary element called lemma. Unlike stemming, which simply removes suffixes, lemmatization considers the word's meaning and grammatical structure [4]. Lemmatization becomes the better option in sentence similarity tasks requiring high accuracy [5]. Conversely, stemming offers better computational speed and similar performance. These techniques enhance students' performance, especially in reading and writing.

This study delves into the applications and implications of stemming and lemmatization in English classrooms. It aims to provide teachers with insights that may impact pedagogical practices by investigating these linguistic features concerning vocabulary acquisition and text comprehension. This study seeks to answer the following key questions. The first is what linguistic features related to stemming and lemmatization are employed in English language classrooms? Secondly, how do these features contribute to vocabulary acquisition and retention?

This study aims to enrich the pedagogy of English language teaching and learning. Its novelty lies in its application of natural language processes where stemming and lemmatization are employed in English language classrooms. The findings of this study may empower teachers and policymakers to harness the potential of stemming and lemmatization in cultivating linguistic awareness among learners. With a clear understanding of the theoretical underpinnings and practical applications of stemming and lemmatization, teachers can create engaging and meaningful learning opportunities for English language learners.

In the Philippines, diverse dialects influence vocabulary development. The depth and quantity of a student's vocabulary shape their language skills. As learners move beyond basic vocabulary, understanding derivational affixes becomes increasingly vital [6]. Hence, this study explores strategies that enhance morphological awareness, such as word segmentation and recognizing common affixes. It advocates for teachers to support learners in analyzing word structure.

Research has shown that explicitly teaching morphological concepts, such as prefixes, suffixes, and root words, can significantly benefit students' language learning. By understanding how words are formed and transformed, students can more effectively infer the meanings of unfamiliar words, leading to improved reading comprehension. Furthermore, morphological awareness empowers students to construct words correctly and enhance their writing abilities [7]. In English classrooms, stemming can aid in developing more robust vocabulary acquisition and retention strategies, as students can better recognize and manipulate word roots and affixes. Lemmatization, however, can be a powerful tool for teaching vocabulary and grammar. Unlike merely removing affixes, lemmatization goes deeper by mapping words to their dictionary forms or lemmas.

Moreover, Jiang [8] highlighted the value of morphological education in expanding students' vocabulary, which is related to stemming and lemmatization. By emphasizing word structure and instructing students in morphological analysis, teachers can enhance the efficacy of these methods in the classroom. This research indicates that providing clear guidance on morphological analysis can greatly enhance learning new words and comprehension of what is read.

Naismith and Juffs [9] analyzed learners' use of mid-frequency lexical items in writing, comparing them to expert speakers. Using lemmatization, they found that while learners showed accuracy in collocations and derivations, they overused verbs and underused nouns. Lexical sophistication was linked to writing scores, but adolescent second language or L2 students' writing lacked density and diversity, as they relied on basic, commonly used words [10]. However, lexical density and diversity do not predict writing quality, as effective word use depends on recognizing related forms within different lexical units [11].

Providing students with specific morphology education, which includes lemmatization, can significantly improve their vocabulary and reading comprehension. For example, breaking down words into their morphological parts makes it easier for students to comprehend word meanings and grammatical functions. Lemmatization is a strategy that aims to improve comprehension and usage of words by breaking them down into their most basic forms. Teaching common prefixes, suffixes, and root words is an effective way to teach morphological instruction. This process helps students identify words in their base forms during writing and reading tasks, aiding lemmatization [12].

Despite the benefits of combining the target language with corresponding cultural studies, little is known about how this process enhances comprehension and communication in English classrooms [13]. Results point to the potential benefits of strategically using many languages for classroom management and

language development, though, it may also cause confusion or overreliance on the first language [14]. The integration of particular linguistic features, such as lemmatization and stemming, with English education within L2 learners has yet to receive much academic attention. This study contextualizes stemming and lemmatization commonly used in computational linguistics within English language classrooms in the Philippines. By examining these linguistic tools as practical strategies, this study offers novel insights for teachers seeking to enhance vocabulary acquisition and retention for English learners.

2. METHOD

2.1. Research participants

There were nine English instructors from three universities in the Davao Region who served as participants. The selection of participants adheres to the principle of Creswell and Poth [15], which emphasizes the intentional selection of relevant cases to yield valuable insights from the data. This study follows an established set of criteria such as i) the participants must teach English core subjects; ii) must have at least three years of teaching experience in tertiary education; and iii) must either complete a master's degree or earn academic units in the master's degree program in the field of English.

2.2. Data collection

The initial phase of data collection involves document analysis of classroom sessions. This phase includes observing the teacher participants' actual classroom instruction, where stemming and lemmatization may be employed. Morgan [16] emphasized that document analysis has been an underutilized approach in qualitative research, despite its value. When used to analyze pre-existing texts, this method allows researchers to conduct studies that might otherwise not be feasible.

Following the document analysis, in-depth interviews (IDI) were conducted. The researchers carried out the IDIs with nine English language instructors from three universities in the Davao Region, Philippines. IDIs allow the participants to freely share their perspectives, experiences, and perceptions regarding the use of stemming and lemmatization in the classroom [17]. The researchers used the validated interview guide protocol, which included a brief overview of the study followed by a series of primary and probing questions based on the key research questions.

2.3. Framework of analysis

Colaizzi's descriptive phenomenological method was used to sort, organize, analyze, and present the narrative dataset, aiming to describe the role of stemming and lemmatization in vocabulary acquisition [18]. This framework includes familiarizing the data, identifying significant statements, formulating meanings, clustering themes, developing description, producing fundamental structure, and seeking verification. Figure 1 illustrates the methodological flow. Phase 1 involved collecting and analyzing classroom recordings to identify the linguistic features of stemming and lemmatization. Phase 2 focused on participant interviews, data collection, and interpretation. Before data collection, the researchers sought permission and consent from the participating universities and teacher participants. Ethical research guidelines were followed such as ensuring informed consent, confidentiality, and the right to withdraw at any time.
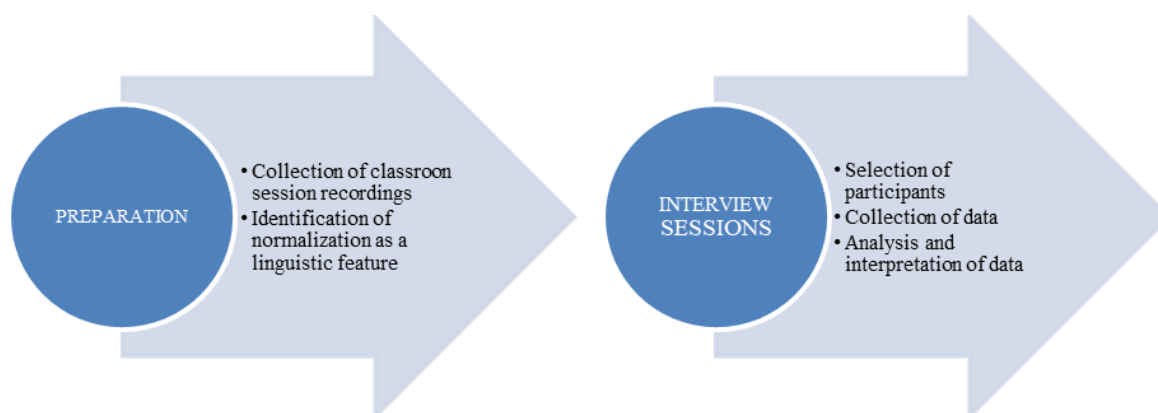

Figure 1. The methodological framework of the study

3.   RESULTS AND DISCUSSION

Classroom observations show that stemming and lemmatization are employed by the teacher-participants. Notably, the teacher-participants used both linguistic features in English language teaching. The following exemplars reflected the use of stemming and lemmatization:

"When teaching vocabulary, I sometimes break down words like 'writing', 'thinker', and 'run'." (IDI_A)
"I see to it that my students know the base form of words." (IDI_B)
"In our lessons, I use stemming to simplify complex words. For example, the words happiness, happily, and happy, all relate to happy. They are word families." (IDI_C)
"I explain to my students the difference between better and good. This helps them understand the words in different contexts." (IDI_D)
"I emphasize lemmatization by helping students grasp the use of words in context. I explain that 'knives' is the plural form of 'knife'." (IDI_E)

These exemplars highlight the role of stemming and lemmatization in enhancing language comprehension and production especially in the Philippines where English is a second language. Stemming, as the process of reducing words to their base form, allows teachers to simplify complex vocabulary items so that students can understand more and grasp ideas better. Teachers can employ stemming to break down words, which not only aids in vocabulary acquisition but also helps students to understand word families. It is an essential aspect of English as a language rich in morphological variations. Gupta and Arora [19] explored various stemming methods, with suffix-stripping being the most common, alongside semi-supervised, affix removal, and brute-force techniques.

Conversely, lemmatization involves converting words to their base forms. This is pivotal in teaching students how to use words in context. In the Philippines, where English is widely used, understanding word forms enhances communicative competence. For example, in the previous exemplar of IDI_D, the instructor explained the difference between better and good, guiding students to recognize that better is the comparative form of good. This distinction significantly enhances students' communicative competence in classrooms with diverse linguistic backgrounds. Similarly, Dash [20] examined lemmatization of inflected nouns in Bengali as part of the lexical processing while Fernández [21] highlighted its challenges in old English verbs due to spelling variations. The lack of a complete and systematic lemmatization process hinders natural language processing (NLP) studies due to old English's complex inflectional system [22]. Furthermore, L2 learners correctly interpreted terms used in distinct parts of speech only 56% of the time, indicating that lemmas would be a more effective approach. Hence, lemmatization is a critical process in corpus linguistics and linguistic research [23].

The integration of stemming and lemmatization in the classroom mirrors the linguistic landscape in the Philippines, where English plays a vital role in language collaboration amid the diversity of Philippine languages and dialects. Teachers who incorporate these linguistic features into their lessons enhance language learning by showcasing the richness of the English language within the local context. Teachers can teach how words are formed, modified, and adapted, hence, empowering students to be more versatile and responsive in their use of English, whether in formal or in informal settings.

However, students struggle to understand word variations and how academic vocabulary is not just about memorizing words but also about understanding their relationships and usage in context. The effectiveness of explicit instruction and incidental learning play key roles in vocabulary development. It implies that isolated word lists may not be enough. Students need structured instruction and exposure to words in meaningful contexts [24]. Similarly, stemming and lemmatization focus on uncovering the base form of a word, whether through affix removal (stemming) or by analyzing context to determine the correct dictionary form (lemmatization). Likewise, grammar should be taught in conjunction with subject matter and in the context of language usage, such as through texts, to enhance understanding and application [25].

Research by Fengyu [26] also revealed that while traditional methods effectively support vocabulary retention, they often fail to encourage practical vocabulary use. Contextual learning is a powerful strategy because it encourages active application of vocabulary by immersing learners in real-life scenarios. Additionally, technology-assisted methods improve pronunciation and create immersive experiences that contribute to better vocabulary usage. A multimodal approach that blends traditional and modern methods offers a comprehensive solution and promote vocabulary recognition and active use. Hence, balancing conventional techniques with technology and real-life contexts is crucial for improving students' ability to apply vocabulary effectively in various situations. Such approach is exemplified in using short story techniques to teach English vocabulary especially in retrieving and memorizing words [27].

The use of these linguistic tools aligns with the Philippine educational framework, which emphasizes communicative competence and critical thinking which are essential skills in 21st-century language learning. Teachers who engage learners in activities involving stemming and lemmatization encourage them to analyze language structures and develop a deeper understanding of the language. The data presented in Table 1 highlights a significant theme concerning the impact on vocabulary acquisition and retention among learners, which emerged as a crucial factor in understanding how stemming and lemmatization contribute to vocabulary development.

Table 1. Themes on how do stemming and lemmatization contribute to vocabulary acquisition and retention among English language learners

Emergent themes	Cluster themes
Impact on vocabulary acquisition and retention	Cognitive impact on vocabulary learning
	Enhancing vocabulary comprehension and retention
Learner perception and engagement	Student attitudes towards language learning
	Learning styles
Teaching strategies and classroom implementation	Pedagogical strategies and classroom practices
	Optimized teaching approaches
	Balancing cognitive load in vocabulary acquisition

3.1. Impact on vocabulary acquisition and retention

The two interrelated cluster themes support this, which are cognitive impact on vocabulary learning and enhancing vocabulary comprehension and retention. The study's findings highlight the significant role of vocabulary acquisition and retention in stemming and lemmatization. This emergent theme facilitates vocabulary acquisition and enhances the long-term retention of newly-learned words.

Limited English morphological awareness can hinder lexical growth. Linguistic pedagogy, particularly word formation rules, positively impacts English as a foreign language or EFL competence more than non-linguistic methods [28]. Participants in this study noted that stemming and lemmatization helped learners grasp vocabulary by focusing on the base forms of words, recognizing word patterns, and strengthening word connections. One participant expressed, *"I found it easier for my students to remember words when they see the connection between the words and their roots."* This perspective was echoed by several other participants, indicating that stemming and lemmatization contribute to building a more interconnected vocabulary network in learners' minds. The cognitive strategy of pattern recognition emerged as a key benefit which allows learners to generalize their understanding of one word to others within the same word family, thereby enhancing comprehension.

The cluster theme enhancing vocabulary comprehension and retention, highlights the positive effects of stemming and lemmatization on long-term vocabulary retention. Participants consistently pointed out that these techniques helped their students to acquire new vocabulary more effectively. By simplifying the learning process and focusing on the core meaning of words, learners could internalize vocabulary in a more meaningful and lasting manner. One participant reflected on this process by saying, *"When my students learn words through word stems, they remember the words better."* Moreover, various types of contextual variation influence word learning among bilinguals. Research suggests that learning new word meanings is more effective when words are encountered in diverse semantic contexts rather than repetitive ones, regardless of language proficiency. However, switching between languages does not necessarily improve vocabulary acquisition compared to studying in a single language [29]. The repeated exposure to and application of root words through stemming and lemmatization likely contribute to deeper encoding in memory, thus improving both comprehension and retention.

3.2. Learner perception and engagement

The emergent theme, emerged as an influential factor in the effectiveness of vocabulary acquisition and retention in the English language classroom. This theme explores how students perceive their learning experiences and how these perceptions influence their engagement with language learning. Two interrelated cluster themes, student attitudes toward language learning and learning styles, emerged during the interviews.

Students' attitudes toward language learning significantly impact their classroom engagement and vocabulary acquisition. Students with a positive attitude toward learning English are more motivated and likely to engage in language learning [30]. In contrast, negative attitudes can hinder students' willingness to fully participate in learning. In this study, participants reported that students who viewed language learning as valuable and enjoyable were more likely to employ strategies that enhanced vocabulary retention. These students often demonstrated a growth mindset. They believed in their ability to improve further, which fueled their engagement.

3.3. Teaching strategies and classroom implementation

The theme examines the dynamic relationship between instructional methods and student engagement in vocabulary learning. This theme is framed by three cluster themes. They are pedagogical strategies and classroom practices, optimized teaching approaches, and balancing cognitive load in vocabulary instruction.

Effective pedagogical strategies are essential for successful language instruction. These strategies include interactive activities, technology integration, and alignment between learners' needs and instructional objectives. Building a strong vocabulary is fundamental to language acquisition, as it enhances communication skills and comprehension. Additionally, applying educational games as a learning technique with young learners increased learner engagement and improved knowledge absorption and retention [31]. Strategies such as collaborative learning, task-based activities, and real-world applications have proven beneficial. One participant noted that *"Interactive vocabulary exercises make it easier for learners to remember words."* Students found that interactive exercises made learning more enjoyable, engaging, and effective in memorizing vocabulary [32].

Optimized teaching approaches aim to maximize learning outcomes by leveraging the strengths of both teachers and students. These approaches often combine traditional and modern teaching methods. Specifically, teachers enhance vocabulary instruction by strategically using spaced repetition and multimodal learning, incorporating visual and kinesthetic activities to accommodate various learning styles. While multimodal input (verbal+visual) positively influences vocabulary learning, it is less effective for long-term recall than monomodal (verbal-only) input [33]. The cognitive load from additional visual information may hinder retention, and students expressed mixed reactions. Some found it engaging and helpful, while others considered it time-consuming and distracting.

4. CONCLUSION

This study explores the role of stemming and lemmatization in vocabulary acquisition and retention in English language classrooms. The findings indicate that teachers effectively employ these techniques, with three key themes emerging: their impact on vocabulary acquisition and retention, learner perception and engagement, and teaching strategies and classroom implementation. The study confirms that integrating stemming and lemmatization into curricula enhances student learning. However, the small sample size and qualitative approach limit generalizability. Future research should involve a larger and more diverse participant pool, explore various educational settings, and adopt mixed-method approaches to further evaluate their impact. Additionally, investigating students' perspectives on these techniques would provide valuable insights.

AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Jose G. Tan, Jr.	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		
Blessa Kay F. Caballero		✓			✓		✓	✓		✓	✓	✓		

C : **C**onceptualization	I : **I**nvestigation	Vi : **Vi**sualization
M : **M**ethodology	R : **R**esources	Su : **Su**pervision
So : **So**ftware	D : **D**ata Curation	P : **P**roject administration
Va : **Va**lidation	O : Writing - **O**riginal Draft	Fu : **Fu**nding acquisition
Fo : **Fo**rmal analysis	E : Writing - Review & **E**diting	

CONFLICT OF INTEREST STATEMENT

No conflict of interest was observed in the conduct of this study.

ETHICAL APPROVAL

In the conduct of this study, ethical considerations and guidelines were observed. As a set of Principles and Ethics Committee (UMERC) of the Mindanao State University guided the researchers. This is reflected in Form 2.6 Certificate of Approval with UMERC Protocol No. 2023-426. This included emphasizing voluntary participation, informed consent, anonymity, confidentiality, and results dissemination.

DATA AVAILABILITY

The data that support the findings of this study are available on request from the corresponding author, [JGTJ]. You may email him for data request. The data, which contain information that could compromise the privacy of research participants, are not publicly available due to certain restrictions.

REFERENCES

[1] H. Zhang and J. Lin, "Morphological knowledge in second language reading comprehension: examining mediation through vocabulary knowledge and lexical inference," *Educational Psychology*, vol. 41, no. 5, pp. 563–581, 2021, doi: 10.1080/01443410.2020.1865519.

[2] K. C. Levesque, H. L. Breadmore, and S. H. Deacon, "How morphology impacts reading and spelling: advancing the role of morphology in models of literacy development," *Journal of Research in Reading*, vol. 44, no. 1, pp. 10–26, 2021, doi: 10.1111/1467-9817.12313.

[3] Z. Abidin, A. Junaidi, and Wamiliana, "Text stemming and lemmatization of regional languages in Indonesia: a systematic literature review," *Journal of Information Systems Engineering and Business Intelligence*, vol. 10, no. 2, pp. 217–231, 2024, doi: 10.20473/jisebi.10.2.217-231.

[4] O. Toporkov and R. Agerri, "On the role of morphological information for contextual lemmatization," *Computational Linguistics*, vol. 50, no. 1, pp. 157–191, 2023, doi: 10.1162/coli_a_00497.

[5] R. Pramana, Debora, J. J. Subroto, A. A. S. Gunawan, and Anderies, "Systematic literature review of stemming and lemmatization performance for sentence similarity," *Proceedings of the 2022 IEEE 7th International Conference on Information Technology and Digital Applications, ICITDA 2022*, 2022, doi: 10.1109/ICITDA55840.2022.9971451.

[6] P. Nation and L. Bauer, "What is morphological awareness and how can you develop it?" *Language Teaching Research Quarterly*, vol. 33, pp. 80–98, 2023, doi: 10.32038/ltrq.2023.33.04.

[7] B. Wahyoedi and I. R. G. Barus, "Investigating teacher's linguistic competence in teaching English for academic purposes," *International Journal of English and Applied Linguistics (IJEAL)*, vol. 2, no. 3, pp. 348–360, 2022, doi: 10.47709/ijeal.v2i3.1735.

[8] Y. Jiang, "The role of morphology in english vocabulary teaching," *Learning & Education*, vol. 9, no. 2, p. 120, 2020, doi: 10.18282/l-e.v9i2.1422.

[9] B. Naismith and A. Juffs, "Finding the sweet spot: learners' productive knowledge of mid-frequency lexical items," *Language Teaching Research*, vol. 28, no. 3, pp. 1106–1142, 2021, doi: 10.1177/13621688211020412.

[10] U. Maamuujav, "Examining lexical features and academic vocabulary use in adolescent L2 students' text-based analytical essays," *Assessing Writing*, vol. 49, p. 100540, 2021, doi: 10.1016/j.asw.2021.100540.

[11] D. Brown, T. Stoeckel, S. Mclean, and J. Stewart, "The most appropriate lexical unit for L2 vocabulary research and pedagogy: a brief review of the evidence," *Applied Linguistics*, vol. 43, no. 3, pp. 596–602, 2022, doi: 10.1093/applin/amaa061.

[12] E. Sulistyawati, A. Nugroho, and B. Bram, "Morphological teaching strategies to enhance students' vocabulary knowledge and reading comprehension," *JET (Journal of English Teaching)*, vol. 7, no. 2, pp. 179–190, 2021, doi: 10.33541/jet.v7i2.2472.

[13] F. Gao, "Negotiation of native linguistic ideology and cultural identities in English learning: a cultural schema perspective," *Journal of Multilingual and Multicultural Development*, vol. 42, no. 6, pp. 551–564, 2020, doi: 10.1080/01434632.2020.1857389.

[14] N. K. Trinh, "EFL learners' perceptions of translanguaging in English classes at an HCM English centre," *International Journal of Language Instruction*, vol. 4, no. 1, pp. 50–64, 2025.

[15] J. W. Creswell and C. N. Poth, *Qualitative inquiry and research design: choosing among five approaches*. 4th ed., Thousand Oaks: SAGE Publications Inc, 2018.

[16] H. Morgan, "Conducting a qualitative document analysis," *Qualitative Report*, vol. 27, no. 1, pp. 64–77, 2022, doi: 10.46743/2160-3715/2022.5044.

[17] D. E. Gray, *Doing research in the real world*. 3rd ed., Thousand Oaks: SAGE Publications Inc, 2014.

[18] B. K. Gumarang Jr., R. C. Mallannao, and B. K. Gumarang, "Colaizzi's methods in descriptive phenomenology: basis of a Filipino novice researcher," *International Journal of Multidisciplinary: Applied Business and Education Research*, vol. 2, no. 10, pp. 928–933, 2021, doi: 10.11594/ijmaber.02.10.10.

[19] S. Gupta and B. Arora, "Stemming techniques on English language and devanagari script: a review," *Lecture Notes in Electrical Engineering*, vol. 832, pp. 541–550, 2022, doi: 10.1007/978-981-16-8248-3_45.

[20] N. S. Dash, "Lemmatization of inflected nouns," in *Language Corpora Annotation and Processing*, Singapore: Springer Singapore, 2021, pp. 165–194, doi: 10.1007/978-981-16-2960-0_8.

[21] L. G. Fernández, "Sources and steps of corpus lemmatization," *Revista Española de Lingüística Aplicada/Spanish Journal of Applied Linguistics*, vol. 33, no. 2, pp. 416–442, Dec. 2020, doi: 10.1075/resla.18024.gar.

[22] R. T. Alonso, "Advances in the automatic lemmatization of old English: class V strong verbs (L-Y)," *Revista de Lingüística y Lenguas Aplicadas*, vol. 17, pp. 143–161, 2022, doi: 10.4995/rlyla.2022.16132.

[23] T. Ishii, P. Bennett, and T. Stoeckel, "Challenges in the assumptions of using a flemma-based word counting unit," *Vocabulary Learning and Instruction*, vol. 10, no. 1, pp. 1–15, 2021, doi: 10.7820/vli.v10.1.ishii.

[24] L. Wei, "Teaching academic vocabulary to english language learners (ELLs)," *Theory and Practice in Language Studies*, vol. 11, no. 12, pp. 1507–1514, 2021, doi: 10.17507/tpls.1112.01.

[25] R. K. Saydanovna, "Teaching grammar: in isolation or in context?" in *Teaching Foreign Languages in the Context of Sustainable Development: Best Practices, Problems and Opportunities*, ISCRC, Oct. 2023, pp. 170–173, doi: 10.37547/geo-32.
[26] Z. Fengyu, "The impact of vocabulary learning methods on students' vocabulary application skills," *English Language Teaching and Linguistics Studies*, vol. 5, no. 4, p. 206, 2023, doi: 10.22158/eltls.v5n4p206.
[27] A. A. Ali Mansoor, O. S. M. Mohammed, H. R. Ahmed, A. N. M. Awadh, H. M. Abdulfatah, and E. Y. Sheikh, "English language teaching through a short story: a technique for improving students' vocabulary retrieving," *Cogent Education*, vol. 10, no. 1, Dec. 2022, doi: 10.1080/2331186X.2022.2161221.
[28] I. K. Wardana, "The impact of English morphological awareness on vocabulary enrichment: a causal-affect relationship research," *REiLA : Journal of Research and Innovation in Language*, vol. 5, no. 1, pp. 1–16, 2023, doi: 10.31849/reila.v5i1.11200.
[29] J. Lauro, A. I. Schwartz, and W. S. Francis, "Bilingual novel word learning in sentence contexts: effects of semantic and language variation," *Journal of Memory and Language*, vol. 113, 2020, doi: 10.1016/j.jml.2020.104123.
[30] R. Kirkpatrick, J. Kirkpatrick, and A. Derakhshan, "An investigation into the motivation and attitudes of Japanese students toward learning English: a case of elementary and junior high school students," *Asian-Pacific Journal of Second and Foreign Language Education*, vol. 9, no. 1, 2024, doi: 10.1186/s40862-023-00243-z.
[31] A. M. Saleh and A. S. Ahmed Althaqafi, "The effect of using educational games as a tool in teaching English vocabulary to Arab Young children: a quasi-experimental study in a kindergarten school in Saudi Arabia," *SAGE Open*, vol. 12, no. 1, 2022, doi: 10.1177/21582440221079806.
[32] E. M. Rahayu and P. Bhaskoro, "Interactive media edpuzzle and its implementation in teaching vocabulary in new normal era," *Jo-ELT (Journal of English Language Teaching) Fakultas Pendidikan Bahasa & Seni Prodi Pendidikan Bahasa Inggris IKIP*, vol. 9, no. 1, p. 1, 2022, doi: 10.33394/jo-elt.v9i1.4425.
[33] W. Li, J. Yu, Z. Zhang, and X. Liu, "Dual coding or cognitive load? Exploring the effect of multimodal input on English as a foreign language learners' vocabulary learning," *Frontiers in Psychology*, vol. 13, 2022, doi: 10.3389/fpsyg.2022.834706.

BIOGRAPHIES OF AUTHORS

Jose G. Tan, Jr. 🔴 is an assistant professor at the University of Southeastern Philippines at the College of Teacher of Education and Technology, University of Southeastern Philippines. He received his Bachelor in Secondary Education, Master in English Language Teaching and Doctorate in Applied Linguistics from the Mindanao State University, Marawi City. His years of experience as an educator prove his dedication to his vocation. He has served as college secretary, principal, program head, extension head, and currently as the program head of the master of education in language teaching (English) in the graduate studies of teacher education and technology at University of Southeastern Philippines, Tagum-Mabini Campus, Davao del Norte, Philippines. He has published in several refereed international journals. He can be contacted at email: josejr.tan@usep.edu.ph.

Blessa Kay F. Caballero 🔴 is an associate professor at Mindanao State University at Naawan at the College of Education and Social Sciences, Department of Secondary and Elementary Education. She served the university as a college dean. Currently, she is the coordinator of the Office of Advanced Education and Lifelong Learning. She finished her doctor of philosophy in language studies and master of arts in English language teaching at Mindanao State University, Marawi City. She also completed master of arts in education, majoring in special education at Cebu Technological University. She has published research on topics related to language teaching, critical discourse analysis, and the use of digital tools and arts in special education. She can be contacted at email: blessakay.caballero@msunaawan.edu.ph.