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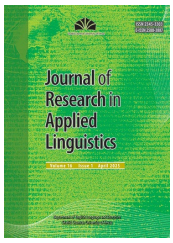

Research Paper

Vietnamese EFL Learners' Productive Derivative Knowledge: The Role of Part of Speech, Receptive Derivative Knowledge, and Derivative-Formation Strategies

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Abstract

This study examines the role of part of speech (POS) and receptive derivative knowledge (RDK) in Vietnamese EFL learners' production of derived forms of given headwords (henceforth, productive derivative knowledge (PDK). Seventy-three Vietnamese EFL university learners, first, performed a decontextualised productive derivative form-recall test of 90 headwords and a receptive derivative test. Twenty of these learners were also interviewed in an in-depth individual format with a view to understanding their experiences and processes of forming the target derivatives. Findings revealed that successful production rates of derivatives of different POS differed significantly in favor of verb and noun derivatives than adjective and adverb counterparts, and there was a strong positive correlation between PDK and RDK. Learners' perspectives uncovered a complex process of forming derivatives that involved not only item-based and system-based mechanisms but also a wide range of other strategies and idiosyncratic trajectories of vocabulary learning/use that influenced their PDK. The implications for derivative instruction, assessment, and research are discussed.

Keywords: Productive Derivative Knowledge; Receptive Derivative Knowledge; Vietnamese EFL Learners; Part of Speech; Derivative-Formation Strategies.

1. Introduction

The past few years have witnessed a growing body of research delving into the measurement of L2 learners' derivative knowledge which is conceptualised as the ability to recognize (e.g., Laufer et al., 2021; Snoder & Laufer, 2022) or produce (e.g., Iwaizumi & Webb, 2021, 2022, 2023) derived forms (e.g., *hopeful*, *hopefully*) of a base word (e.g., *hope*). The former and the latter are referred to as receptive derivative knowledge (RDK) and productive derivative knowledge (PDK), respectively. These kinds of knowledge are salient for their various affordances: First, it has been demonstrated that derivative literacy could enhance L2 (i.e., English) learners' lexical knowledge and facilitate effective communication in the L2 (Iwaizumi & Webb, 2022; Nation, 2013). Second, it is a core part in research on lexical profiling (e.g., Webb & Rogers, 2009) as well as in the development of English (as an L2) wordlists (e.g., Dang et al., 2017) and tests of vocabulary (e.g., Webb et al., 2017). Third, derivative knowledge may inform policymakers and teachers of how vocabulary lessons should be designed and presented (Graves et al., 2019; Iwaizumi & Webb, 2022, 2023).

Prior research has also shed light on the extent to which L2 learners possess knowledge of derivatives both receptively and productively. It was consistently reported that learners had considerable knowledge of receptive

derivational affixes (Iwaizumi & Webb, 2023; Laufer et al., 2021; Sukying, 2018). However, their productive mastery of derivatives measured via a contextualised format (Iwaizumi & Webb, 2021; Schmitt & Zimmerman, 2002) or a decontextualised form-recall test (Iwaizumi & Webb, 2022) was lower. Indeed, L2 learners might find it challenging to produce derivatives of the target headwords (Iwaizumi & Webb, 2022, 2023). Further research to better understand L2 learners' PDK and its relationship with their RDK is warranted.

Some research has shown that there are underlying factors affecting learners' production of target derivatives. These include learners' vocabulary breadth, frequency of headwords (e.g., Iwaizumi & Webb, 2022, 2023; Nguyen & Nguyen, 2024), and derivatives' POS (i.e., verbs, nouns, adjectives, adverbs; Iwaizumi & Webb, 2022, 2023) and RDK (Iwaizumi & Webb, 2023; Sukying, 2018). Insightful as these findings are, such research is still very limited, and Vietnamese EFL learners have remained an unexplored group in PDK research. Moreover, L2 learners' perspectives on how they come to produce derived forms in a decontextualized derivative form-recall test have remained largely unexplored.

2. Literature Review

In this section, the relationship between the different variables such as (i) derivative POS and (ii) RDK and PDK and how derivatives are acquired will be addressed. This provides a context leading into the current study.

2.1. Relationship Between POS and PDK

In lexical research, POS has been shown to be one of the multiple factors impacting on L2 learners' vocabulary learning because each word class has its own properties of form and use (see Peters, 2020 for a review). In derivative assessment, empirical evidence has begun to indicate the role of POS in L2 derivative acquisition. In a pioneering study, Schmitt and Zimmerman's (2002) analyzed the performance of 106 participants of varying profiles (i.e., 86 advanced ESL undergraduates and graduates together with 20 ESL postgraduates) in a contextualised form-recall test. The results indicated that verbs were produced the most accurately, followed by nouns, adjectives, and adverbs. This finding is in line with Iwaizumi and Webb's (2022) recent study which employed a decontextualised form-recall test. In particular, based on the results performed by 130 participants (i.e., 23 L1 speakers and 107 L2 learners), it was found that nouns and verbs were more successfully produced than adverbs.

Iwaizumi and Webb (2023) investigated the impact of word-related variables including POS on learners' PDK via the adoption of generalized linear mixed-effects models. The learners' profiles and the test format were similar to those in their previous study (Iwaizumi & Webb, 2022), but the number of participants was slightly lower (i.e., 128 including 21 L1 speakers and 107 L2 learners). A different analysis approach was also adopted (e.g., excluding inflected forms of verbs that could be considered as another POS: *prepared* as an adjective) and the results revealed that adverbs ranked first, followed by adjectives, verbs, and nouns. The authors attributed this result to three primary factors: First, adverbs usually constitute "-ly," a high-frequency suffix, meaning that their grammatical function is already apparent, which makes their learning and memorization easier than other POS derivatives that may be formed with various affixes (Bauer & Nation, 2020). Second, nouns were the least successfully generated possibly because of their abstract meanings. Moreover, certain suffixes to form nouns can also be added to prompt words to make adjectives, leading to confusion.

In addition, how the decontextualized form-recall test was scored could have been an influencing factor. In prior studies, one point was awarded for each correct response, be it the correct identification of the given headword's POS or the correct production of its derived forms. For instance, if students were able to recognize the target prompt word *girl* as a noun, they received one point. Equally, one point was awarded if they were able to write its derivative noun *girlhood* or its adjective *girly* or *girlish*. However, recognizing the POS of a headword is not the same as generating its derived forms, which might not measure PDK properly. Indeed, Nguyen and Nguyen's (2024) research indicated that the L2 learners' production of target derivatives differed when headwords were counted (HC) and not counted (HNC). It is, thus, important to investigate how L2 learners produce derivatives of different parts of speech using both HC and HNC methods.

2.2. Relationship Between RDK and PDK

RDK has previously been assessed using different instruments (e.g., Snoder & Laufer, 2022; Sukying, 2018), which showed a considerable level of RDK. For example, Sukying (2018), self-designing the RDK test, reported that the Thai EFL adolescents showed a strong awareness of affixes of given headwords. Others adopted the Word Part Level Test (WPLT; Sasao & Webb, 2017), the standardized one thus far, based on prior research (Bauer & Nation, 1993; Nation, 2013). It aims to measure learners' capability to identify the forms (Form), meanings (Meaning), and grammatical functions (Use) of affixes. With such a test, Sasao and Webb's (2017) findings, as reported in Brown et al. (2020), revealed that Form, Meaning, and Use recognition was successful at 73%, 83.7%, and 62.9% of the time, respectively. Such high rates were echoed in Iwaizumi and Webb's (2023) study that also employed the WPLT. Generally, L2 learners have demonstrated considerable RDK in prior research though different ways of measurement were employed across studies.

The link between RDK and PDK is still in its early stage of exploration. In 2018, Sukying focused on the measurement of 486 Thai EFL learners' affix knowledge and found that "receptive knowledge of affixes fosters productive use of affixations" (p. 200). Similarly, Iwaizumi and Webb (2023) reported that RDK significantly facilitated the production of derivatives in a decontextualised form-recall test. Moreover, of the three constructs in the WPLT, Meaning was found to have the strongest effect on learners' PDK, followed by Use and Form. The association between RDK and PDK can be explained via the close relationship between vocabulary breadth and knowledge of affixes (Iwaizumi & Webb, 2022; Mochizuki & Aizawa, 2000).

2.3. Mechanisms of Derivative Acquisition

It has been generally proposed that derivatives can be learned in two primary ways: item-based and system-based learning (Boers, 2021; Schmitt & Zimmerman, 2002). The first means that learners study a derivative as a whole without breaking it into constituent parts while from a system-based learning view, learners draw on knowledge of derivational affixes to understand and learn L2 words. For example, they learn the word *agreement* as consisting of two components: *agree* (base form) + *ment* (affix). There is some empirical evidence showing that L2 derivatives are acquired in the system-based mode (Ellis & Schmidt, 1998), which is more likely for more advanced learners as their proficiency develops (Iwaizumi & Webb, 2022, 2023).

Current understanding has been centered around item-based and system-based learning as two common ways of derivative acquisition (Iwaizumi & Webb, 2022, 2023). However, because learning strategies are defined as "actions chosen by learners for the purpose of language learning" (Griffiths, 2018, p. 88), arguably, different learners may have various ways to acquire language. Indeed, it has been shown that L2 learners employ a wide range of strategies including morphological awareness for vocabulary learning in general (e.g., Agustín-Llach, 2023; Gu, 2018; Rashidi & Mirsalari, 2016) or lexical form-meaning mapping (e.g., Candry et al., 2017; Deconinck et al., 2014). Yet, how they recall and/or form derivatives of given headwords, what strategies they employ, and what sources of knowledge they draw on in a derivative form-recall test has not been investigated in prior research.

Previous studies have so far contributed to advancing our understanding of L2 learners' PDK. Nonetheless, inferences from these works were primarily based on the participants' test performance (e.g., Iwaizumi & Webb, 2022, 2023; Schmitt & Zimmerman, 2002). The processes by which L2 learners come to create derived forms of target headwords have yet to be explored in derivative research. Furthermore, prior research counted the correct identification of the POS of given headwords as correct responses (Headwords counted, HC), yet this is arguably not the same as their ability to produce derived forms. It remains unclear how L2 learners produce derivatives of given headwords when the correctly identified POS of headwords was not counted (Headwords not counted, HNC; cf. Nguyen & Nguyen, 2024). The present study, thus, fills those gaps by seeking to address the following research questions:

1. To what extent do Vietnamese EFL learners produce target derivatives of different parts of speech in a decontextualised form-recall test when the two scoring methods (HC and HNC) are employed?
2. To what extent do Vietnamese EFL students demonstrate receptive derivative knowledge?
3. What is the relationship between Vietnamese EFL learners' receptive and productive derivative knowledge?

4. What strategies do Vietnamese EFL learners utilize to produce derivatives of the given headwords in a decontextualised form-recall test?

3. Methodology

3.1 Participants

A convenience sampling technique was employed to recruit the participants. Seventy-three Vietnamese English-majored second-year students from two intact classes enrolling in a writing course taught by the first researcher at a Vietnamese university participated in the present study on a voluntary basis. The writing course targeted a B2 level, according to the Common European Framework of Reference for Languages (CEFR), though the students' language proficiency levels ranged from B1 to B2, as observed by the first researcher as their course instructor. Most of them (60/73) were female as this is a common characteristic of EFL classes in Vietnam. They were aged around 20 and had learnt English as a compulsory subject at school since grade 6. These 73 students were chosen because they completed both the productive derivative form-recall test and the Word Part Levels Test (WPLT). Those who were absent in either of the tests were not included.

3.2. Research Instruments

3.2.1. Productive derivative form-recall test

The decontextualized derivative form-recall test designed by Iwaizumi and Webb (2022) was employed to measure the students' PDK. As the present study aimed to investigate Vietnamese EFL learners' ability to recall derived forms of given prompt words, not their ability to use derivatives in context-specific situations, the selection of a decontextualized test was appropriate to control for potential factors associated with understanding contextual clues in a contextualized test that might affect recall (Iwaizumi & Webb, 2023). As described in Iwaizumi and Webb (2022), 90 headwords sourced from the British National Corpus (BNC) and Corpus of Contemporary American English (COCA; Nation, 2012) were targeted in this test. They were from different word frequency levels (1000-5000) and organized in three sections, with 30 headwords per section, of which 20 were most frequent 1000-2000 levels (10 each) and the remaining 10 were from 3000-5000 word family levels (from two to five words per level). According to Iwaizumi and Webb (2022), given that high-frequency words cover an extensive range in English texts, more of them were included in the test. Words with fewer than three derived forms and multiple-meaning words were also deselected. For a sample, see Appendix A.

3.2.2 The word part levels test (WPLT)

The WPLT, intermediate level (Sasao & Webb, 2017) was employed to gauge the participants' RDK as it is "the only measure of receptive knowledge of derivational affixes that has been initially validated to date" (Iwaizumi & Webb, 2023, p. 313). As the students in the present research were around a B1-B2 level of proficiency (CEFR), the WPLT (intermediate level) was selected. As summarized in Table 2, the test has three sections that measure the students' ability to recognize the Form, Meaning, and Use, respectively, of 79 given affixes sourced from the most high-frequency 10,000 word families in the BNC (Nation, 2004). In the Form section, the test takers were required to identify 11 existing prefixes and 26 suffixes among distracting cues while they were to select the right meaning of given affixes in the Meaning section. For example, the correct answers in the Form part are (3) *de-* and (4) *-ab* for prefixes and (1) *-ous* and (1) *-ism* for suffixes while for Meaning, the correct responses are (1) earlier and (4) away from. The Use section involves identifying the POS (noun, verb, adjective, and adverb) of each of the 21 given affixes. For instance, *em-* and *-ence* are indicators of a verb and a noun, respectively. For a summary, see Appendix B.

3.2.3. Learner interviews

Twenty out of the 73 students who had completed the productive derivative form-recall test volunteered to be interviewed in an in-depth individual format. The interviews were mainly concerned with how and why they produced the derived forms of the target prompt words. In other words, the students reflected on the process of forming derivatives and the strategies they employed during the test. The interviews were mainly exploratory and thus did not rely on any predetermined list of strategies. Instead, students were asked around the central question of how they produced the derived forms of the target headwords, and how they recalled and formed derivatives. Strategies in this paper were therefore

adopted in their broadest sense of 'how to' and generally referred to as "actions" that learners elect to serve their learning (Griffiths, 2018, p. 88).

3.3 Procedure

Prior to the official data collection, a printed version of the derivative form-recall test was piloted with a similar group of students who completed it with three sections in one round in their normal class schedule. The instructions were further delivered in Vietnamese and the students had a chance to ask questions for clarification before they started the test. Exhaustion and boredom were reported as the test was perceived to be overlong with too many headwords and derivatives to handwrite. In the official data collection, the test was, thus, administered in two rounds on two different days. The first round focused on the first two sections (60 headwords) and the second targeted the remaining (30 headwords). The students were given as much time as they wished to complete the test and returned it to their class teacher, the first author of the present study. They were not permitted to consult any materials or their teacher/peers during test performance. The average two-round test completion time ranged from 45 to 95 min.

The students were interviewed after completing the second round of the productive derivative form-recall test as soon as logistically allowed. Some students were interviewed immediately after the test, whereas the others were one or two days later. The interviews were in Vietnamese to ensure full understanding and to grant the students comfort in recounting their experiences forming derivatives of the target headwords. Each interview lasted approximately 30 min and was audio-recorded with the interviewee's prior consent.

Three days after the interview, the students completed the intermediate WPLT (Sasao & Webb, 2017) on paper in their normal class time. The Vietnamese instructions and explanations were further provided to maximize understanding before the test started. Again, the students completed it in as much time as they needed and without any kind of support. The average recorded time on this test was 25-40 min (also see Nguyen & Nguyen, 2024).

3.4 Data Analysis

3.4.1 Scoring the productive derivative form-recall test

The answer keys developed by Iwaizumi and Webb (2022) were employed to score the derivative form-recall test, with minor modifications (e.g., prompt words *human* and *mediate* as an adjective and a verb respectively were added as keys for their being originally missing). Several student-generated derivatives were not included in the listed keys, so they were not counted to facilitate comparison across studies given the limited research on derivatives to date (Iwaizumi & Webb, 2022, 2023).

The decontextualized derivative form-recall test was scored via two methods: The first one involved counting headwords (HC), that is, if a headword as a prompt word was recognized for its POS, it received 1 point. On the contrary, in the second method, labelling the correct word part of a given headword was not counted (HNC). Both HC and HNC were employed to measure PDK more comprehensibly because identifying the POS of the prompt words and producing their derived forms are not identical.

One point was awarded to each correct answer and an incorrect response or no response received no point. The maximum points were 622 and 525 for HC and HNC, respectively. In the latter method, seven of the 90 target prompt words could be in two-word classes (e.g., *hope* (noun, verb), *human* (noun, adjective), *measure* (noun, verb), *western* (noun, adjective), *military* (noun, adjective), *tangle* (noun, verb), and *mystic* (noun, adjective). As such, the maximum number of the derived forms was 525 (622-90-7).

In both methods, recognizing a nonexistent form received no point, because the present study only measured students' PDK. Infected forms were not included, either. For example, *communicates* was excluded because *communicate* and *communicates* are both of the same word class (verb). However, adjectives such as *arranged* and *prepared* were considered derivatives, because adding *-ed* changes the POS of *arrange* (verb) to adjective (arranged). In addition, misspelt forms involving double consonants (e.g., *happiness, happiness; forgetably, forgettably*) and suffixes (e.g., *indicator, indicater, adapter, adaptor*) were rated as correct responses as they "allowed for the examination of the ability to produce derivatives instead of mastery of written forms of derivatives" (Iwaizumi & Webb, 2021, p. 9). In compliance

with prior research (Iwaizumi & Webb, 2021, 2022; Nguyen & Nguyen, 2024), derivatives formed by both prefixes and suffixes were included to measure the students' PDK more comprehensively.

The data were prepared in an Excel spreadsheet for each target headword and for each POS (noun, adjective, verb and adverb) of each test section. For the HC method, 20 test papers (27.4%) were coded independently by the first researcher and a paid research assistant with a master's degree in TESOL and an overall IELTS band score of 7.5. Agreement was reached at 87-96 % for the three sections of the derivative form-recall test, which indicated high interrater reliability (Cohen et al., 2018). After that, the research assistant scored the remainder of the data.

To derive data in the HNC method, any responses that identified the given headwords were removed. Score accuracy in both methods was checked carefully by the researchers before analysis and any discrepancies were resolved via discussion. The Cronbach's alpha of .982 for HC and .975 for HNC confirmed the internal consistency of the decontextualized form-recall test.

3.4.2 Scoring the WPLT

The answer keys of the WPLT (Sasao & Webb, 2017) were employed to score its performances. Each correct answer was awarded one point. Following Iwaizumi and Webb (2023), the sum score in each section of the WPLT (Form, Meaning, and Use) was calculated separately for each participant and inputted into an Excel spreadsheet for later analysis. The first author and the research assistant mentioned earlier marked 20% of the test data, and reached an agreement at 95%, 96%, and 98%, respectively, for Form, Meaning, and Use. After that, the first author scored the remaining data.

3.4.3 Statistical analysis

The test scores from the Excel spreadsheets were imported into the Statistical Package for the Social Sciences (SPSS; version 20.0) for analysis. Descriptive statistics were obtained, and the test data were checked for normality via the Shapiro-Wilk test (Field, 2018; all p values < .05) before further analysis. Friedman nonparametric tests were conducted to compare the mean percentages between POS derivatives in each scoring method (HC and HNC), with post-hoc Wilcoxon signed-rank tests (a Bonferroni correction significance level of $p < .008$ (.05/6) for multiple comparisons). The effect sizes (r) for Wilcoxon tests were also reported as suggested by Field (2018). A series of nonparametric Spearman's rho correlation tests were run for the nonnormally distributed test data to explore the relationship between RDK and PDK. The correlation coefficients were also effect sizes, interpreted as small ($r = .10$), medium ($r = .30$) and large ($r = .50$; Larson-Hall, 2016).

3.4.4 Analyzing the interview data

The analysis first involved transcribing the interviews in their entirety. The interview transcripts were double-checked for precision and then analyzed in the original language (Vietnamese) for themes that arose in relation to the central question of how learners came to form the derivatives of the given prompt words. For each interview account, theme-based coding (Cohen et al., 2018) was adopted as an open inductive process of reading and rereading the data and recording emergent themes as they were. New themes were manually noted in the interview transcripts and entered into an Excel spreadsheet for subsequent analysis of the frequency of mentions in each and all interviews. The themes were initially treated as 'provisional' (Silverman, 2021) to be confirmed when coding was complete. For illustration, the interview extracts were translated into English with the adoption of pseudonyms for the sake of participants' privacy and confidentiality. Translated quotes were cross-checked by an EFL teacher-researcher for accuracy.

4. Results

4.1. RQ1. To What Extent Do Vietnamese EFL Learners Produce Target Derivatives of Different Parts of Speech When the Two Scoring Methods (HC and HNC) Are Employed?

Table 1 presents the descriptive statistics of the decontextualized derivative form-recall test in mean percentages for each POS in the HC and HNC methods. In the HC method, the accurate production rates for nouns, adjectives, verbs, and adverbs were 24%, 19%, 43%, and 19%, respectively. Regarding the HNC method, the learners produced on average 16% of a total of 195 possible nouns, of which adjectives, verbs, and adverbs were produced at 16%, 12%, and 18%, respectively. Clearly, when the headwords were not included, the production rates were much lower for all parts of speech; especially there was a sharp decrease from 43% to 12% in the case of verbs.

Table 1. *Mean Percentages of the Decontextualized Derivative Form-Recall Test in the HC and HNC Methods (N=73)*

Scoring Method	Part of Speech	Min	Max	*M*	*SD*
HC	Noun	.06	.45	.24	.08
	Adjective	.01	.51	.19	.09
	Verb	.05	.89	.43	.17
	Adverb	.02	.69	.19	.12
HNC	Noun	.01	.37	.16	.07
	Adjective	.01	.47	.16	.08
	Verb	.00	.70	.12	.13
	Adverb	.02	.69	.18	.12

*Note. The maximum scores (HC) for nouns, adjectives, verbs and adverbs are 229, 209, 73, and 111, respectively. The maximum scores (HNC) for nouns, adjectives, verbs and adverbs are 195, 187, 33, and 110, respectively.

The Friedman tests were, further, conducted to compare the percentages between the different POS in each scoring method. For the HC method, the results indicated a statistically significant difference between word classes, $\chi^2(3) = 149.179$, $p < .001$. The post-hoc Wilcoxon signed-rank test results indicated that success for nouns (Mdn =.25) was significantly higher than adjectives (Mdn =.18; $Z = -6.285$, $p < .001$, $r = .74$), and adverbs (Mdn =.16; $Z = -5.355$, $p < .001$, $r = .63$). Furthermore, the learners were able to produce more verbs (Mdn =.45) than nouns ($Z = -7.158$, $p < .001$, $r = .84$), adjectives ($Z = -7.367$, $p < .001$, $r = .86$) and adverbs ($Z = -7.404$, $p < .001$, $r = .88$), with all large effect sizes ($r > .50$). However, there was a nonsignificant difference between production rates of adjectives and adverbs ($Z = -1.310$, $p = .190$). These findings together suggest that accurate production of derivatives was subject to their POS in the HC method advantaging verbs and nouns more than other word parts.

For the HNC method, the Friedman test results revealed a statistically significant difference between derivatives of different POS, $\chi^2(3) = 57.009$, $p < .001$. Post-hoc Wilcoxon signed-rank test results (again adjusted $p < .008$ (.05/6)) indicated that when the headwords were excluded, verbs (Mdn = .09) were the least successfully produced of all. They were less successful than nouns (Mdn = .16; $Z = -4.567$, $p < .001$), adjectives (Mdn =.15; $Z = -4.458$, $p < .001$,) and adverbs (Mdn =.15; $Z = -5.221$, $p < .001$), all with large effect sizes ($r = .53$, $r = .52$, and $r = .61$, respectively). However, there was no significant difference between noun and adjective derivatives ($Z = -1.767$, $p = .077$), nor between noun and adverb derivatives ($Z = -1.832$, $p = .067$). Yet, adverbs were produced at a significantly higher rate than adjectives ($Z = -2.940$, $p = .003$), though with a medium effect size ($r = .34$). In brief, the effects of derivatives' POS were inconsistent and subject to the scoring methods, though being more pronounced for verbs and nouns.

4.2. RQ2. To What Extent Do Vietnamese EFL Students Demonstrate Receptive Derivative Knowledge (RDK)?

Table 2 presents the descriptive statistics for the participants' RDK measured by the WPLT covering three constructs, namely Form recognition (Form), Meaning recognition (Meaning), and Grammatical function recognition of derivational affixes (Use). Regarding Form, the learners achieved an average score of 27.38 out of a maximum number of 37. In other words, they were able to recognize the existing affixes 74% of the time (81.1% for prefixes and 71% for suffixes).

4.3. RQ3. What Is the Relationship Between Learners' Productive and Receptive Derivative Knowledge?

Regarding Meaning, they successfully identified the meanings of 14.21 affixes on average (67.7%), with slightly more than half and 3/4 of the meanings of prefixes and suffixes being correctly recognized, respectively. Meanwhile, the Use rate was 62.14% of the target cases (13.05/21). It is clear that these learners demonstrated quite considerable receptive knowledge of affixes, but success appeared to be greater with Form than Meaning and Use:

Table 2. *Descriptive Statistics of the WPLT (N = 73)*

		Min	Max	Mean	*SD*
Form	Prefixes	2.00	11	8.92	2.13
	Suffixes	4.00	26	18.45	5.39
	Total	7.00	37	27.38	6.90
Meaning	Prefixes	1.00	9	4.95	1.914
	Suffixes	4.00	12	9.15	2.246
	Total	6.00	21	14.22	3.81
Use	Use	5.00	21	13.05	3.83
	Total	23.00	77	54.53	12.70

*Note. Maximum number in the form session is 37 (11 and 26 respectively). Maximum number of the meaning session is 21 (9 and 12 respectively). Maximum score for the Use session is 21.

The Spearman's rho correlation test results (see Table 3), further, revealed a strong positive correlation between RDK and PDK (r_s =.586, p < .001), with the strongest correlation being found with Use (r_s =.525), followed by Meaning (r_s=.515) and Form (r_s =.504; all p values <.001):

Table 3. *Spearman's Rho Correlations Between PDK and RDK in the HC Method (N = 73)*

	Spearman's Rho Correlation Coefficient	RDK	Form	Meaning	Use	PDK
RDK	r_s	1	.916**	.851**	.835**	.586**
Form	r_s	.916**	1	.712**	.636**	.504**
Meaning	r_s	.851**	.712**	1	.606**	.515**
Use	r_s	.835**	.636**	.606**	1	.525**
PDK	r_s	.586**	.504**	.515**	.525**	1

Note. ** Correlation is significant at the 0.01 level (2-tailed).

A summary (see Tables 4 and 5) of the results of Spearman's rho correlations between derivatives of different word parts and the different aspects of RDK showed that in both scoring methods, overall RDK was strongly correlated with produced derivatives of all word parts (all p values <.001). Furthermore, noun derivatives correlated more with verbs than adjectives and adverbs in the HC method (r_s=.866, r_s=.856, r_s=.724, and r_s=.604, respectively). However, a slightly different pattern was found with the HNC method: nouns were more strongly correlated with adjectives (r_s=.866) than verbs (r_s=.747) and adverbs (r_s=.736):

Table 4. *Correlations Between Derivatives of Different Parts of Speech in the HC Method and RDK (N=73)*

		Noun	Adjective	Verb	Adverb	RDK
Noun	r_s	1.000	.856**	.866**	.724**	.604**
	p	.	.000	.000	.000	.000
Adjective	r_s	.856**	1.000	.855**	.805**	.512**
	p	.000	.	.000	.000	.000
Verb	r_s	.866**	.855**	1.000	.744**	.565**
	p	.000	.000	.	.000	.000
Adverb	r_s	.724**	.805**	.744**	1.000	.513**
	p	.000	.000	.000	.	.000
RDK	r_s	.604**	.512**	.565**	.513**	1.000
	p	.000	.000	.000	.000	.

Note. **.Correlation is significant at the 0.01 level (2-tailed).

Table 5. *Correlations Between Derivatives of Different Parts of Speech in the HNC M2ethod and RDK (N=73)*

		Noun	Adjective	Verb	Adverb	RDK Total
Noun	r_s	1.000	.866**	.747**	.736**	.546**
	p	.	.000	.000	.000	.000
Adjective	r_s	.866**	1.000	.774**	.788**	.516**
	p	.000	.	.000	.000	.000
Verb	r_s	.747**	.774**	1.000	.660**	.465**
	p	.000	.000	.	.000	.000
Adverb	r_s	.736**	.788**	.660**	1.000	.520**
	p	.000	.000	.000	.	.000
RDK Total	r_s	.546**	.516**	.465**	.520**	1.000
	p	.000	.000	.000	.000	.

Note. **.Correlation is significant at the 0.01 level (2-tailed).

4.4. RQ4. What Strategies Do Vietnamese EFL Learners Utilize to Produce Derivatives of the Given Headwords in a Decontextualized Form-Recall Test?

The interviews aimed to answer the third research question, asking how the students formed the derivatives of the given target headwords. These students narrated generating certain word parts more than others, and this is related to the varied strategies that they employed in the process of recalling the target-derived forms and the influencing factors.

4.4.1 Prior knowledge of the prompt words

About 12 out of 20 students made reference to prior knowledge of the prompt words or otherwise their unfamiliarity, which facilitated or constrained their production of the intended derivatives.

> *For the prompt word that I don't know, it is a challenge, I can't write any of its nouns, verbs, ….* (Hung, Class 2)

> *I don't know the word 'obsess' and 'anatomy', so I gave up at all their word classes.* (Hai, Class 1)

However, knowing the prompt words did not always guarantee successful recall of its related word parts. Illustrative comments are as follows:

> *Sometimes I know that word (prompt word), but I don't know its verb, or adjective, so I don't have the answer.* (Minh, Class 1)

> *I know the word 'girl' but don't know 'girlhood'; don't know how to create 'girlhood'* (Huyen, Class 1)

These students' accounts point to the two models of derivative acquisition, namely item-based and system-based learning, which surfaced as idiosyncratic learning paths among individual students.

4.4.2 Item-based vs. system-based learning

About 12 out of 20 interviewees cited learning words case by case (item-based learning) through exposure (reading) or prior learning that affected their production of target derivatives:

> *When I read a passage, if I encounter three nouns, I just know nouns, I rarely search its adjectives or verbs. So I don't know many family words.* (Nhi, Class1)

> *In my school years, I learnt that word as noun or verb, but not its related words, so I couldn't write many forms of many words in this test.* (Hoai, Class 1)

Several students were explicit about their prior knowledge of only the prompt item, thus leaving its related word parts unanswered:

> *I know that word (prompt word), but I don't know its verb, or adjective, so I didn't have the answers.* (Ngan, Class 2)

> *I was not able to write 'conclusive', I know 'conclusion' but not its adjective.*

While this suggests case-by-case learning, eight students overtly mentioned resorting to affix knowledge to analyze and identify the POS of prompt words:

> *I don't know this word (microscope) but the ending 'scope' shows that it is a noun, word endings help me identify parts of speech.* (Hoang, Class1)

> *I don't know the meaning of this word, but I know that words ending -ic are adjectives.* (Bich, Class 2)

They also reported using affixes to produce derived forms. One female student with good writing skills, from the first author's observation as her class teacher, shared that:

> *For the word 'plausible', I don't even know its meaning, but my secondary school teacher once told me that words ending in -ible is usually an adjective and its noun should end in -ity. Then I formed 'plausibility' without even knowing its meaning.* (Phuc, Class 2)

Here, the ability to recall appears to be facilitated by prior lexical learning as the student above cited her lower secondary school teacher in guiding her to form derivatives for prompt words of certain endings. Some students were specific about POS affix knowledge, reporting knowledge of how to form nouns contributed to their greater success with noun derivatives:

I know more affixes to form nouns, so I was able to write more nouns than verbs. (Han, Class 2)

I have exposure to fewer prefixes than suffixes; I have learnt more suffixes, for example I add -ment, -tion, … after verbs to form nouns. (Mai, Class 1)

4.4.3 Combined strategies

In addition to affix knowledge, they considered the meaning of their created derivatives to finalize their answer. One student commented:

I don't know the adverb of 'fatal', because I have never seen 'fatally', I know we add -ly to create an adverb, but ***fatally*** *is not logical because of the meaning 'in a fatal way' does not make sense to me. I therefore didn't write the adverb.* (Nhi, Class 1)

This, further, indicates the complexity of forming derived forms which was indeed a process of confirming and disconfirming created derivatives that involved multiple strategies. Six students recounted spelling out the derived form both textually and aurally. One comment reads:

I write down the noun, verb, adjective, using my word formation knowledge, then I read it out loud, if it feels and sounds familiar to my ears, I feel it is likely to be the right form. (Nhung, Class 2)

For these students, the orthographical realization of the 'tried' forms was, further, testified by the familiarity of its auditory representation. Yet, individual variation existed as many interviewees overtly mentioned 'reading aloud' as their starting 'test.' One student narrated:

I read it out loud, if it feels right in my mouth, I write it down. (Ly, Class 2)

For her, the 'rightness' of sound articulation, not to her ears as the above student, but 'in her mouth' informed her decision. Others also adopted aural representation of the hypothesized derived forms not in audible sounds, but mentally:

I don't pay attention to the written form of the target derived word, I just read out the derived in my head. (Kien, Class 1)

I tried with all the different prefixes and suffixes mentally in my head to form the nouns, verbs, if they sound ok and familiar to me, I write them down. (Hien, Class 1)

This denotes verbal representation of the hypothesized derived words to test out their oral forms. 'Wild inventing' words was another strategy as recounted in the following extract:

But sometimes I wildly created my own words, which I didn't know whether they are right or wrong, but for this test I did not leave any blank! (Khanh, Class 2)

The comments here demonstrate that students could employ multiple and perhaps concurrent strategies in the process of recalling target derived words. At the same time, their narratives have also revealed their active recall in their self-devised agency.

4.4.4 Individualized trajectories of learning and using vocabulary

The student interviews additionally revealed unique ways individuals adopted to learn and use vocabulary. Which parts of speech are more likely to be produced was recounted to depend on how individual students attend to lexical items in their exposure. One student commented:

I find it easiest to produce derived adjectives because when I learn vocabulary, I focus on adjectives the most. In my way of using vocabulary, I tend to use many adjectives in my writing. Indeed, I have a personal liking for adjectives, that is why I know more adjectives and I often create verbs and nouns based on the adjectives that I know. (Tri, Class 2)

It is notable that this student's preferences for adjectives in the meaning-making process of writing perhaps contributed to his knowledge of derivatives. This appears to be subject to individual variation as another student reported being more adept at forming noun derivatives for its being her preferred use of vocabulary in EFL writing:

When I learn related forms of a word, I don't know much about forming verbs; I know more nouns; in my writing, I prioritize nominalization because I like to write this way, so I know fewer verbs than nouns. (Tuyet, Class 1)

Again, all this shows students' personalized ways of not only learning lexical items, channeling attention to them but also using them in meaning-focused activities such as writing.

5. Discussion

The present study explored how the Vietnamese EFL university students produced derivatives of different word parts in a decontextualized derivative form-recall test of 90 headwords developed by Iwaizumi and Webb (2022) and the relationship between this PDK and receptive knowledge of affixes measured by the WPLT. The results indicated that POS had a significant role to play, with verb derivatives being most successful, followed by nouns, adjectives, and adverbs in the HC method. This pattern corroborates previous studies (Iwaizumi & Webb, 2022; Schmitt & Zimmerman, 2002) which found verbs and nouns had the highest production rates. Yet, it differs from the findings of Iwaizumi and Webb (2023) that adverbs were most accurately produced. This could be perhaps due to the different modes of analysis adopted. For example, in Iwaizumi and Webb (2023), inflected forms of verbs that formed a different POS (e.g., *arranged* as an adjective) and derivatives with multiple parts of speech (e.g., *relative* as both a(n) adjective and noun) were not included while they were in our study. This and the different strategies that individuals employ to learn and use derivatives (see RQ3) might account for the different results.

However, the finding that verb derivatives were the least successful (12%) in the HNC method is worth-noting. This is understandable given that among the 73 target verb derivatives, more than half (40) were the prompt words, whereas of all the possible nouns (229), adjectives (209,) and adverbs (111) that these students should have produced, 34 (229-195), 22 (209-187) and 1 (111-110) were headwords, respectively (see Table 4). In other words, identifying given verbs as verbs (HC) is less challenging than writing a verb derivative of a given word, alluding to the role of scoring methods in assessing PDK:

Table 4. *Number of Possible Derivatives of Different Word Parts in the HC and HNC Methods*

	Noun	Adjective	Verb	Adverb	Total
HC	229	209	73	111	622
HNC	195	187	33	110	525

The results, further, indicated that the Vietnamese students in the present study were able to recognize the Form, Meaning, and Use of given affixes in the WPLT on average 74%, 67.7%, and 62.14% of the time, respectively. This finding generally echoes previous research that employed the same WPLT (Iwaizumi & Webb, 2023; Sasao & Webb, 2017), though the success rates were slightly higher in the latter studies, particularly in terms of Meaning. For example, in Iwaizumi and Webb (2023), 74.8% (Form), 78.9% (Meaning), and 66.9 % (Use) were reported while 73%, 83.7%, and 62.9%, respectively, in Sasao and Webb (2017, as reported in Brown et al., 2020). In other prior research (e.g., Snoder & Laufer, 2022), the L2 learners demonstrated quite considerable knowledge of receptive affixes despite the varied ways of measurement across studies.

The strong positive correlation between RDK and PDK was consistent with the findings of previous studies (e.g., Iwaizumi &Webb, 2023; McCutchen & Stull, 2015; Sukying, 2018). This finding could be explained by the nature of the productive derivative form-recall test that involved writing derived forms of given headwords, which is arguably connected to the ability to recognize orthographic forms of affixes (Form) and the grammatical functions of affixes (Use) in the WPLT. The correlation with Meaning corroborates findings of prior research that knowledge of affix meanings contributed to the successful production of derivatives (Iwaizumi & Webb, 2023). This could be because, as Iwaizumi and Webb (2023) explained, there is a close relationship between knowledge of affix meanings and vocabulary breadth. That is, there might be concurrent development of vocabulary size and knowledge of affixes (Mochizuki & Aizawa, 2000; Sukying, 2018).

The students' perspectives in the present study are refreshingly telling of derivative formation as a complex dynamic process in which a wide range of strategies were deployed by individual students. Whereas the derivative recall test results showed that derivatives' POS affected their production, from the interviews it is interesting that this influence might be associated with how individual learners build up and use their lexical repertoire. In this regard, item-based and

system-based learning surfaced as two broad mechanisms among varied influencers. However, viewing derivative acquisition in these two manners only might be simplistic in view of students' reports in the current study. Despite the low rate of successful production, their accounts featured a complex dynamic process of derivative formation, confirmation, and rejection through self-devised means of recalling such as drawing on prior knowledge of prompt words and affixes, displaying derived forms orthographically and/or verbally, meaning judgement and even 'wild invention' of words. At first glance, the variety of strategies to recall derivatives here appear to broadly resonate with a wide range of strategies learners reported using in research on general vocabulary learning (Agustín-Llach, 2023; Candry et al., 2017; Deconinck et al., 2014; Gu, 2018). Yet, these reported strategies were bound to a specific derivative form-recall test and the recounted individual differences in strategy could be perhaps due to their idiosyncratic ways of acquiring derivatives. The extent to which L2 learners draw on formal knowledge of affixes to process derived forms has been found to depend on their language proficiency (Clahsen & Felser, 2006) and vocabulary size (Iwaizumi & Webb, 2022, 2023). Notably, that the students related to their idiosyncratic use of vocabulary in writing to explain their derivative learning is compelling and surprising, suggesting the individual need to use word classes in communication might drive their acquisition of derivatives. However, this is only speculative as unfortunately the relationship between learners' RDK/PDK and their use in meaning-driven processes such as writing is yet to be known in current research on derivatives. Since strategies are the "actions" learners elect to employ to achieve their learning goals (Griffiths, 2018, p. 88), their choice of use in recalling the target derivatives as well as in meaning conveyance in written communication might involve a wide range of manifestations in response to their own needs.

6. Conclusion

The present study aimed to understand how POS affected the Vietnamese EFL learners' production of derived forms of the 90 target headwords in a decontextualized form-recall test using both HC and HNC methods. It also examined the relationship between RDK and PDK and the strategies learners employed to form derivatives of the target headwords. The findings revealed a significant role of derivatives' POS in the L2 learners' production of derived forms and a strong positive correlation between RDK and PDK. The learners' perspectives uncovered a complex process of vocabulary learning that involved not only item-based and system-based learning but also individualized vocabulary learning paths that possibly influenced their PDK.

The findings of the current research point to several significant implications for teaching and researching derivatives. Firstly, the strong positive correlation between these two types of knowledge implies that the WPLT (Sasao & Webb, 2017) could be a platform for teaching and learning derivational affixes. Furthermore, materials and textbook design should incorporate activities that target both derivative recognition and production. These activities could invite students to recognize existing affixational forms and meanings or produce the derived forms of the target headwords in decontextualized formats. Tables of word parts (Nation, 2013) for students to write missing derivatives of target headwords in decontextualized formats could be useful. Equally, materials writers could also consider designing contextual clues which ask students to complete each given sentence by supplying the correct derived form of the word provided (Iwaizumi & Webb, 2021). Furthermore, it is vital that meaning-focused activities be designed for students to put their derivative knowledge into use to achieve communicative purposes.

Next, the learners' perspectives underscore the importance of classroom instruction and pedagogy that respond to individualized learning trajectories of different groups of learners. The role of prior learning and affix knowledge as well as input/exposure and productive language use (writing/speaking) should also be of pedagogical importance. Equally, it is important to enrich learners' vocabulary via different instructional techniques such as keyword methods (e.g., Alibeigynejad & Fahimniya, 2015) and frame semantics (e.g., Mousavi et al., 2015). Furthermore, the methods of scoring derivatives (HC and HNC) mediated the role of POS, highlighting the need for teachers and researchers to consider how to assess L2 learners' derivative knowledge. Importantly if PDK measures L2 learners' ability to produce derived forms of given headwords, not the ability to recognize the POS of given derivatives, then HNC would be a more appropriate method. Finally, extrapolation of RDK and PDK should be viewed in light of how they are measured. Either the ability to recognize affixed forms, meanings and grammatical functions (RDK) or the capability to produce derived forms of given headwords (PDK) might be solely indicators of mastery of forms. They do not slightly equate with the ability to use them in meaning-focused activities such as writing an essay. The fact that even L1 speakers of English find it challenging to produce derivatives in the decontextualized form-recall test (Iwaizumi & Webb, 2022, 2023) suggests this

kind of test might not sufficiently measure PDK. It is, thus, essential that practitioners provide extended opportunities for students to put their RDK/PDK into use to convey intended meanings in both written and oral communication. In this way, declarative/procedural knowledge of derived forms and affixes will be likely translated into automatic and fluent use to achieve communicative purposes (Suzuki, 2024).

The present study should be considered with its limitations: First, the relatively small sample size of 73 participants who were Vietnamese English-majored university students might limit generalizability to other groups of learners. Second, it did not examine how students produce derivatives at each frequency level (1000-5000), thus how frequency might interact with POS to impact upon L2 learners' ability to produce derived forms of given headwords is not known. This could be a useful direction for future studies. In addition, gauging L2 learners' vocabulary size via the updated Vocabulary Level Test (Webb et al., 2017) would add more insights into how this variable together with POS might influence their production of derivatives and the relationship between RDK and PDK. Next, the learners' self-reported data should be additionally used in derivative research to shed greater light on what forms of appropriate instructional support to provide to develop students' PDK. Note that the participants performed the derivative form-recall test in the context of a writing course they attended and as such their narratives might differ from students in other courses. Finally, the PDK/RDK tests in the present study could only test recall of derived forms of headwords or recognition of affixes in discrete manners, thus calling for future research to investigate the relationship between these forms of RDK/PDK and how learners use derivatives in free meaning-focused writing/speaking tasks.

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Information on Informed Consent or any Data Privacy Statements

Informed consent from the participant was obtained before the study started.

Author Contributions

Bao Trang Thi Nguyen: Funding acquisition, conceptualization, research design, data collection, data analysis, validation, writing, revising, editing, submitting/correspondence

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Conflict of Interest

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Appendixes

Appendix A. Example Prompt Words From the Productive Derivative Form-Recall Test (Extracted From Iwaizumi & Webb, 2022)

Headword	Noun	Adjective	Verb	Adverb
GIRL	Girl Girlhood	Girly Girlish	X	Girlishly
FORGET	Forgetfulness	forgetful forgettable unforgettable	forget	forgetfully unforgettably
PROBABLY	probability improbability	Probable improbable	X	probably improbably

Appendix B. Structure of the Intermediate WPLT and Examples (Summarized From Sasao & Webb, 2017)

		No of Items	Examples
Form (k = 37)	Prefixes	11	1. (1) ka- (2) ze- (3) de- (4) ti- 2. (1) ba- (2) oa- (3) lu- (4) ab-
	Suffixes	26	1. (1) -ous (2) -ney (3) -ope (4) -ime 2. (1) -ism (2) -ike (3) -nda (4) –arf
Meaning (k = 21)	Prefixes	9	1. ex- (ex-wife; ex-member) (1) earlier (2) person (3) bad (4) can be 2. ab- (abuse; abnormal) (1) person/thing (2) times (3) small (4) away from
	Suffixes	12	1. -ism (socialism; nationalism) (1) into another state/place (2) theory of (3) one (4) small 2. -hood (childhood; motherhood) (1) one (2) halfway (3) bad (4) a state of
Use (k = 21)		21	1. em- (empower; embody) (1) Noun (2) Verb (3) Adjective (4) Adverb 2. -ence (difference; existence) (1) Noun (2) Verb (3) Adjective (4) Adverb
Total		79	