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NOT ALL NOUNS ARE ACQUIRED *EN MASSE*: COUNTABILITY AND (IN)DEFINITENESS IN SECOND LANGUAGE LEARNING OF ENGLISH ARTICLES

This study investigates how L1-Slavic/L2 English learners (N=41) acquire article use across contexts defined by noun type (count vs. mass) and (in)definiteness (definite vs. indefinite). Using an online comprehension task with four conditions (Count–A, Count–The, Mass–Null, Mass–The), we analyze accuracy and error patterns across three proficiency levels (native-like, advanced, intermediate). Results show that mass nouns pose greater challenges than count nouns. Learners frequently overgeneralize *a* to mass noun contexts and make substitution errors, revealing persistent issues with noun categorization. Statistical analyses confirm significant effects of noun type, condition, and proficiency. Our findings contribute to growing research on article acquisition and the semantics of noun classification.

Keywords: second language learning, count/mass distinction, English articles, (in)definiteness, noun semantics, semantics-pragmatics interface

1. INTRODUCTION

The acquisition of English articles remains a persistent challenge for post-puberty learners whose native languages (L1s) lack a comparable determiner system. Numerous studies have documented the variability and difficulty that L2-English learners face in mastering article use, especially in contexts where the distinction between definiteness and indefiniteness intersects with multiple discourse/pragmatic features (e.g., Abudalbuh, 2016; Derkach & Alexopoulou, 2024; Ionin, Montrul & Crivos, 2011; Ionin & Montrul, 2010; Ionin, Zubizarreta & Maldonado, 2008; Kim & Lakshmanan, 2009; Ko, Ionin & Wexler, 2010; Liu & Gleason, 2002; Montrul & Ionin, 2010; Snape, Mayo & Gureli, 2013; Tryzna, 2009; among others). An illustration of the complexity involved in article semantics is provided in example (1):

(1) A: Have you ever been to the White House?
B: No, but I've been to a white house.

Despite being nearly identical in lexical content, the two noun phrases in (1) differ fundamentally in meaning, a distinction signaled by the articles *the* and *a*. The definite noun phrase *the White House* refers to a culturally salient, unique referent, while the indefinite *a white house* introduces a non-specific, novel referent. As Hawkins (1978, 1991) notes, uses of *the* often rely on cultural or situational familiarity, requiring both linguistic and extralinguistic knowledge. For L2 learners who

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come from articleless L1 backgrounds (e.g., Russian), this dual reliance on linguistic form and shared knowledge presents a formidable learning task. In Russian, to convey the semantic contrast shown in (1), speaker B's response would need to be expressed as 'house of white color' (*v dome belogo cveta*) or the adjective would need to appear in a diminutive form (*v belenkom dome*) to differentiate the meaning from 'the White House.'

L2 acquisition data from learners whose L1 lacks articles, such as Russian or Korean, consistently show two primary types of article errors: omission and substitution. Omission errors result in ungrammatical output (e.g., **Honda was totaled* instead of *A Honda was totaled*). In contrast, substitution errors arguably reflect incorrect semantic categorization (e.g., using *a* in a definite context, or *the* in an indefinite one). Substitution errors occur in both directions, suggesting that learners have not yet internalized the semantic/pragmatic features that differentiate *a* and *the*. For example, a Russian-speaking learner might refer to **a father of my fiancée* where the definite *the father of my fiancée* is required, or say *the beautiful silver necklace* in a context where the referent is novel and should be introduced with *a* (Ionin, Ko & Wexler, 2004).

Although much prior research has investigated article acquisition with a primary focus on the semantics of definiteness and specificity, another key factor that interacts with article choice in English is grammatical noun type, i.e. whether the noun is count or mass (Chierchia, 2010; Gardelle, 2019; Rothstein, 2010). The English article system is sensitive to this grammatical distinction: *a* combines only with singular count nouns, *the* is grammatically compatible with both count and mass nouns, and mass nouns often appear with a null article (e.g., *I like antique furniture*, not **an antique furniture*). As shown in Table 1, this creates a morphosyntactic asymmetry in the English article system:

Table 1. English article use across noun types and definiteness.

Noun type	**Indefinite**	**Definite**
Count, sg.	a book	the book
Count, pl.	Ø books	the books
Mass	Ø furniture	the furniture

Because the null article co-occurs with both plural count and mass nouns, its acquisition adds an additional layer of complexity. Prior studies suggest that article errors are not uniformly distributed across contexts but are instead sensitive to the interplay of definiteness, noun type, and referential specificity. A growing body of research has begun to examine the role of the count/mass distinction in L2 acquisition, with several studies examining its interaction with (in)definiteness and/or plural

morphology (Cerqueglini, 2022; Choi, Ionin & Zhu, 2018; Hermas, 2019, 2020; Inagaki, 2014; Sabir, 2019; Snape, 2008; Tang, Fiorentino & Gabriele, 2023; Yoon, 1993; Wu, 2025).

Contributing to this line of work, the present study investigates how learners of English with Slavic L1 backgrounds (Croatian, Czech, Polish, Russian, Slovak, and Ukrainian) acquire article use in contexts where grammatical noun type (count vs. mass) and (in)definiteness interact. Specifically, we examine learners' use of *a* vs. *the* with singular count nouns and of the *null* article vs. *the* with mass nouns. We compare our participants' performance across proficiency levels and (in)definiteness contexts and examine which article contexts pose the greatest challenge in relation to noun type.

The remainder of this article is structured as follows. Section 2 reviews the relevant background literature on article acquisition and the role of noun type; it also outlines the general characteristics of Slavic noun phrases. Section 3 describes the design of the experiment, followed by a discussion of the results. Section 4 discusses the findings in light of previous research. Section 5 concludes the article.

2. BACKGROUND

This section provides the theoretical foundation for the study. Subsection 2.1 reviews previous research on the role of noun type—the count/mass distinction—in shaping L2 acquisition of English articles. Subsection 2.2 turns to the general characteristics of noun phrases in Slavic languages, which represent the L1s of the learners in this study. Together, these subsections situate the study within broader work on article acquisition and highlight why Slavic-speaking learners face persistent challenges with English determiners.

2.1. The role of noun type in L2 article acquisition

A growing body of research in L2 acquisition has addressed the importance of noun type (count vs. mass) in shaping L2 learners' use of articles and/or plural morphology. Yoon (1993) was among the first to investigate the perception of noun countability by L1-Japanese/L2-English learners, focusing on the interaction of noun countability and article use (*null* vs. indefinite *a*). Yoon found that learners struggled not only with article semantics but also with determining how context influences the grammatical noun class (e.g., using *defiance* or *appreciation* as count nouns). Similarly, Wu (2025) investigated Chinese-speaking learners' acquisition of flexible nouns (e.g., *cake(s), stone(s), paper(s),* etc.) that can shift between count and mass interpretations depending on context. While learners performed well in canonical uses, they showed difficulty with less typical meanings, such as interpreting *cake* and *stone* as mass nouns. Inagaki (2014) explored L1-Japanese learners' acquisition

of the mass–count distinction in English, not through article use, but via quantity judgment tasks involving proportional reasoning. Learners showed native-like patterns when interpreting canonical count nouns and substance-mass nouns (e.g., *mustard*), basing their judgments on number or volume as appropriate. However, their performance declined when nouns were ambiguous between mass and count uses (e.g., *string* vs. *strings* in English). These findings suggest that even when learners grasp core count–mass distinctions, noun semantic flexibility remains a learning challenge.

Building on Hua and Lee's (2005) research, Snape (2008) conducted an experimental study to investigate L2 learners' sensitivity to the count/mass distinction and their interpretation of definite descriptions. The study employed two tasks: a grammaticality judgement task to assess learners' ability to recognize acceptable mass and count noun uses, and a forced elicitation task that tested three types of definite expressions: (a) referential definites based on shared knowledge between speaker and hearer, (b) encyclopaedic definites rooted in culturally unique references (similar to *the White House* example in (1)), and (c) larger situation definites, which presuppose situational familiarity without reference to any specific entity. Crucially, noun type (count vs. mass) was manipulated across these conditions. The results revealed an asymmetry: while L1-Japanese learners generally performed well on count noun items, they frequently misjudged grammatical mass noun uses and were more likely to accept ungrammatical mass plurals (e.g., **few sunshines*). L1-Spanish learners demonstrated stronger performance with mass nouns than their Japanese counterparts, but showed similar difficulty when interpreting plural mass nouns in ungrammatical contexts. These findings suggest that even learners from typologically different L1 backgrounds may exhibit persistent challenges with the mass noun category, particularly when the interaction of plurality and definiteness is manipulated.

Hermas (2019) explored how L1-Moroccan Arabic speakers acquire mass generic noun phrases in L3 English, with special attention to the influence of non-facilitative transfer. The findings revealed a clear developmental trajectory: at the pre-intermediate level, learners inappropriately used definite articles with mass generics (indefinite contexts). Intermediate learners began to alternate between definite and bare mass noun forms, suggesting an interlanguage stage in which competing grammatical representations coexisted. Advanced learners demonstrated convergence with native speaker norms, using bare nouns appropriately to express genericity. The study thus highlights the evolving role of transfer and the gradual refinement of grammatical representations in multilingual acquisition. Sabir (2019) also focused on L1-Arabic learners of English and confirmed that mass nouns present a learning challenge for this population of L2 learners.

In aggregate, these studies converge on a key finding: article acquisition in English is sculpted not only by semantic features such as (in)definiteness and specificity, but also by the morphosyntactic

properties of the noun. Mass nouns emerge as a consistent source of difficulty, especially in indefinite contexts where the null article is required. The present study contributes to this growing literature by focusing on L1-Slavic speakers learning English. We aim to systematically compare their article use in contexts involving mass and count nouns across definite and indefinite domains.

2.2. (In)definiteness and general characteristics of Slavic noun phrases

This subsection outlines the main structural characteristics of noun phrases in the L1s of learners in this study: Croatian, Czech, Polish, Russian, Slovak, and Ukrainian. The discussion is based on Zlatić (2014), who surveys NP structure across Slavic. We draw on her examples from Polish and supplement them with our own data from Russian.

A central property of all these Slavic languages is that they are articleless: they lack a determiner system comparable to English. Noun phrases appear bare, without obligatory determiners modifying the noun. (In)definiteness interpretations are inferred from discourse/pragmatic context and word order. The default word order in Slavic is SVO, and definiteness is often associated with topicality (given information/theme), whereas indefiniteness is associated with new information (rheme). The Polish examples in (2) illustrate the typical contrasts:

(2) a. Student lubi Marie
student.Nom likes Mary.Acc
'The student likes Mary.'
b. Marie lubi student
Mary.Acc likes student.Nom
'A student likes Mary.'

In (2a), *student* is interpreted as definite when it occurs in subject/topic position, whereas in (2b) it occurs in post-verbal/rheme position and is interpreted as indefinite.

Slavic languages can also mark definiteness lexically, using demonstratives, which are optional and pragmatically licensed. Like English demonstratives, they agree with the noun in number, but unlike English, they also agree in gender and case in the singular (and only number/case in the plural). Example (3) from Russian illustrates this NP-internal agreement:

(3) Ja lublu et-u knig-u /et-i knig-i
I love this.Acc.Sg.Fem book.Acc.Sg.Fem /these.Acc.Pl books.Acc.Pl
'I love this book/these books.'

In addition, Slavic has an indefinite modifier that corresponds to the English indefinite determiner *some*. This form (e.g., *odin-Nom.Sg.Masc*/*odna-Nom.Sg.Fem* in Russian) appears in contexts requiring a specific indefinite interpretation and shows obligatory agreement in number, gender, and case:

(4) Odin čelovek pokazal nam nužnyj dom
some.Nom.Sg.Masc person.Nom.Sg.Masc showed us right house
'Some person showed us the right house.'

In this Russian example, *odin* is best translated as *some* rather than *a*, since its use signals a specific indefinite meaning. All Slavic languages spoken by the participants have equivalents of *odin/odna*, with similar discourse restrictions.[1]

The nominal system of Slavic encodes a count–mass distinction, with mass nouns marked for partitive/genitive case in object position in appropriate contexts. This is illustrated in (5) from Russian:

(5) a. Anna pokupala sol' na rynke
Anna bought salt.Acc.Sg.Fem at market
'Anna used to buy salt at the market.' (habitual action/imperfective verb)
b. Anna nasypala sol-i v solonku
Anna poured salt.Gen.Sg.Fem into saltshaker
'Anna poured some salt into the saltshaker.' (episodic/perfective verb)

In (5a), the mass feminine noun *sol'* has a generic interpretation in a habitual aspectual context and must appear in the accusative case. By contrast, in (5b) the genitive singular form *sol-i* encodes a partitive reading, denoting an unspecified amount of salt. In both uses, *sol'* is grammatically singular. When combined with demonstratives or adjectives, as in *eta sol'* ('this salt'), NP-internal agreement is expressed in number, gender, and case, just as with count nouns. It is ungrammatical to combine mass nouns with indefinite modifiers such as *odin/odna* (**odna sol'*).

Researchers differ on the precise syntactic analysis of Slavic noun phrases, with some arguing for a DP analysis and others for an NP analysis (e.g., Rutkowski, 2002; Pereltsvaig, 2007; Progovac, 1998; among others). Despite these theoretical differences, there is consensus on the core facts: (i) absence of obligatory determiners comparable to English *a/the*; (ii) agreement in number, gender, and case between demonstratives/*odin/odna* and the noun; (iii) reliance on information-structure

[1] A reviewer asks whether *odin* is pragmatically felicitous in B's response in example (1). It is not: *a white hous*e has a nonspecific indefinite interpretation in this context.

distinctions (theme/rheme) and word order for (in)definiteness interpretation; (iv) count-mass distinction in the nominal system. Thus, across L1s in our study, noun phrases share these fundamental structural properties. We can therefore treat our L2 sample as a coherent group whose article-related challenges in L2 English stem from comparable characteristics of their respective L1s.[2]

3. THE STUDY

Building on the findings from previous research, which underscore the challenges that noun type and (in)definiteness pose for L2 learners of English articles, the present study aims to investigate these dimensions more closely. While prior studies have highlighted the influence of semantic features such as specificity and atomicity, fewer studies have systematically examined how count versus mass nouns interact with article use across proficiency levels. This study aims to bridge this gap by exploring article choice in pragmatically rich dialogue contexts. Our study was guided by the following research questions:

1. How accurately do L1-Slavic/L2-English learners use articles in syntactic and semantic contexts involving different noun types (count vs. mass) and levels of definiteness (indefinite vs. definite)?
2. Are there systematic differences in article use across learner proficiency levels?
3. Which combinations of noun type and definiteness are most prone to article omission and/or substitution errors?

To address these questions, we designed a comprehension-based task, using brief conversational dialogues to elicit article judgments. The following sections describe the experimental design, report the results, and discuss their theoretical and empirical implications.

3.1 Participants

Forty one non-native speakers (NNSs) and fourteen native speakers (NSs) of English were recruited to participate in the study. Prior to the experiment, participants completed a language background questionnaire that elicited information about: (i) age at the time of testing, (ii) native language (defined as the language acquired from birth), (iii) any additional language(s) spoken in early

[2] A reviewer raised the possibility that microvariation in the nominal systems of the included Slavic languages might have subtly influenced L2 learners' accuracy rates in determiner use. In this study, we prioritized the shared core properties of Slavic nominal systems, which justify treating participants as a coherent group for the contrasts under investigation. Nonetheless, future research could examine whether nuanced microvariation across Slavic nominal systems influences how learners acquire English articles.

childhood, (iv) age of first exposure to English, (v) age of arrival (immigration) in the U.S., and (vi) total length of residence in the U.S.

All NNS had begun to learn English as an L2 in their country of birth and were residing in the U.S. at the time of testing. Their native languages included Russian (n = 27), Slovak (n = 7), Ukrainian (n = 4), Croatian (n = 1), Czech (n = 1), and Polish (n = 1). Five participants reported bilingual exposure to another Slavic language during childhood, with language pairs consisting of Ukrainian/Russian (n = 4) and Slovak/Czech (n = 1).

L2 participants also provided a self-assessment of their English proficiency by selecting one of the following categories: native-like, advanced, high-intermediate, intermediate, low-intermediate, or beginner. Based on these self-reports, participants were grouped into three proficiency levels: Native-like (n = 16), Advanced (n = 9), and Intermediate (n = 16). Table 2 summarizes demographics and language background data for each group.

Table 2. Participant demographics and English exposure history by proficiency group.

	Number (M/F)	Mean age at time of testing	Age of exposure to English in the country of birth	Age of arrival in the US	Total years of residency in the US
Native mean (SD) range	14 (3/11)	 39.9 (17.5) 18–72	–	–	–
Native-like mean (SD) range	16 (2/14)	 30.4 (8.67) 22–44	 9.1 (3.9) 5–19	 20.6 (8.56) 8–42	 8.8 (6.4) 3–23
Advanced mean (SD) range	9 (3/6)	 38.4 (8.9) 26–51	 9.2 (3.2) 5–15	 23.8 (6.3) 15–35	 13.6 (7.8) 2–23
Intermediate mean (SD) range	16 (7/9)	 47 (11.1) 22–59	 10.3 (2.1) 6–15	 32.6 (3.8) 22–38	 14.4 (9.5) 4–30

Native-like group. This group consisted of 16 participants (2 male, 14 female), with a mean age of 30.4 years. These learners were first exposed to English in their country of birth at a mean age of 9.1 years, arrived in the U.S. at a mean age of 20.6 years, and had resided in the U.S. continuously for

an average of 8.8 years. (Only two participants arrived in the U.S. before the onset of puberty, at ages 8 and 11.)

Advanced group. This group included 9 participants (3 male, 6 female), with a mean age of 38.4 years. Their mean age of first exposure to English was 9.2 years, and they arrived in the U.S. at a mean age of 23.8 years. Their average length of continuous residence in the US was 13.6 years.

Intermediate group. This group included 16 participants (7 male, 9 female), with a mean age of 47 years. These participants were first exposed to English at a mean age of 10.3 years, arrived in the U.S. at a mean age of 32.6 years, and had the longest average duration of residence in the U.S., at 14.4 years.[3]

3.2 Materials

The experimental stimuli consisted of 48 short written dialogues, evenly distributed across four conditions based on (in)definiteness and noun type: *Indefinite Count-A, Indefinite Mass-Null, Definite Count-The,* and *Definite Mass-The*. Each dialogue took the form of an informal exchange between two speakers and contained a target noun phrase embedded within a sentence (see Table 4). Each target noun appeared with a blank space where participants were asked to choose the most appropriate article from the following multiple-choice menu: *a, the,* or *no article needed*. Table 3 provides a list of the target nouns used in each condition.

[3] This group includes 9 learners self-rated as high-intermediate and 7 as low-intermediate. However, t-test analyses showed no significant differences in performance between these two subgroups. Therefore, they were combined into a single group, referred to as *Intermediate* throughout the study.

Table 3. Target nouns by experimental condition and noun type.

Condition	Target Nouns
Indefinite Count (a)	book, trip, package, job, shop, lamp, house, notebook, coat, bike, necklace, wallet
Indefinite Mass (null)	homework, weather, evidence, success, information, land, rice, wealth, furniture, mail, happiness, sushi
Definite Count (the)	magazine, bus, party, job, website, flash drive, car, laptop, house, key, answer, exit
Definite Mass (the)	homework, weather, evidence, success, information, land, rice, cash, water, milk, patience, butter

Each condition was matched for key structural properties: (i) all target noun phrases were first mentions (i.e., they had no explicit, prior antecedent in the dialogue), (ii) they occurred as syntactic objects of transitive predicates, (iii) they were modified by restrictive relative clauses, and (iv) each condition featured the same set of verbal predicates (*look for, hope for, plan, wait for, have, own, keep, know, get, find, lose, buy*) to ensure consistency in lexical environments. Table 4 presents sample experimental items.

Table 4. Sample experimental dialogues.

Mass-Null	Person A: Is Linda teaching this semester? She looks stressed. Person B: Yes, that's because she works too much. For tomorrow, she is planning __ homework that'll keep her students busy for two days! Person A: What's it about? Person B: Irregular verbs!
Mass-The	Person A: Our new police officer isn't good, is he? Person B: No, he isn't. Look at him. He is digging through his desk, looking for ___ evidence that we put together for him last night. Person A: Oh, he's going to get in trouble for that.

In addition to the 48 experimental items, we constructed 48 distractor dialogues followed by a three-option multiple-choice menu.

3.3 Procedure

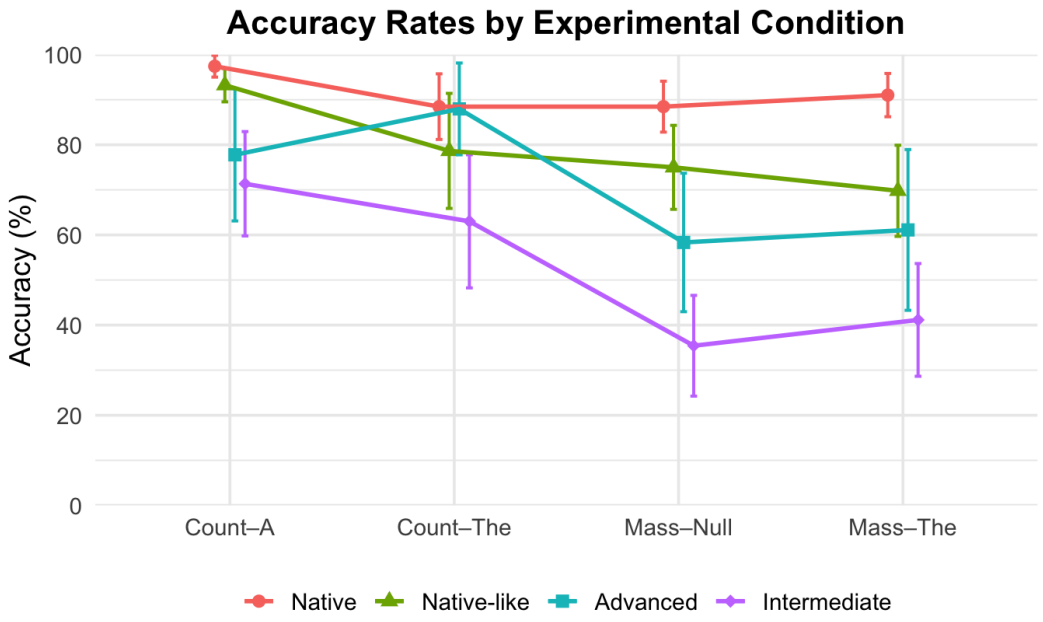
The experimental task was administered using Qualtrics, a secure web-based survey platform. All participants were recruited via the author's professional and personal network and received an anonymous link to the survey by email. They were instructed to complete the survey in a single sitting and in a quiet environment to ensure focused participation. The survey began with a language background questionnaire, which served as the first block of items. This was followed by a set of instructions introducing the task. Participants were asked to imagine the dialogues as representative of informal, everyday conversation.

Before beginning the main task, participants completed a brief practice item (unrelated to articles) to familiarize themselves with the test format. They then proceeded to the full set of experimental and distractor dialogues. The presentation order of both the dialogue items and the multiple-choice response options was randomized using a built-in randomization function in Qualtrics. This ensured that each participant received a unique item and response sequence. Non-native participants completed the task in 40 to 70 minutes, depending on their proficiency level. Upon completion of the task, participants received a $10 digital gift card as compensation for their time.

3.4 Results

Descriptive statistics. Figure 1 presents an overview of participants' accuracy rates across the four experimental conditions (Count-A, Count-The, Mass-Null, and Mass-The) by proficiency group (Native, Native-like, Advanced, Intermediate).

Figure 1. Accuracy rates by experimental condition: percent correct with 95% CI.



The graph clearly illustrates a general trend: accuracy decreases as noun type shifts from count to mass, and as proficiency declines from Native-like to Intermediate. Native speakers show near-ceiling performance in all conditions. Native-like and Advanced L2 learners perform well in the count noun conditions but exhibit greater variability in mass noun contexts. Intermediate learners show the lowest accuracy overall, with particularly sharp declines in the Mass–Null and Mass–The conditions. These group-level accuracy patterns closely align with participants' self-rated proficiency, supporting the validity of the self-assessment categories used in the analysis.

To provide a more granular view of article choice patterns, Table 5 reports the full distribution of article responses (*a*, *the*, and null) by proficiency group and condition.

Table 5. Distribution of article responses by proficiency group and condition (percent correct).

		Native	Native-like	Advanced	Intermediate
Count–A	a	96%	93%	78%	71%
	the	4%	6%	22%	26%
	null	0	1%	0	3%
Count–The	the	89%	79%	88%	63%
	a	11%	21%	12%	33%
	null	0	0	0	4%
Mass–Null	null	88%	75%	58%	35%
	the	6%	17%	28%	25%
	a	6%	8%	14%	40%
Mass–The	the	92%	70%	61%	41%
	a	0	1%	4%	25%
	null	8%	29%	35%	34%

Accuracy rates across the four article conditions (Count–A, Count–The, Mass–Null, and Mass–The) reveal effects of both proficiency level and noun type on determiner choice, with learners overusing *a* and *the* in Mass–Null contexts and overusing the *null* article in Mass–The contexts. Overuse of *a* in the Mass–The context is restricted to the Intermediate group.

ANOVA analyses. To determine whether the observed patterns in article accuracy across conditions and proficiency groups were statistically significant, we conducted a series of repeated measures analyses of variance (ANOVAs). The results are summarized in Table 6.

Table 6. Results of repeated measures ANOVA on article accuracy by proficiency level, noun type, and condition.

Effect	F-statistic and p-value
Proficiency level	$F(3, 47) = 39.281$, $p < 0.001$
Condition	$F(3, 146) = 16.052$, $p < 0.001$
Proficiency level x Condition	$F(9, 146) = 2.473$, $p < 0.01$
Noun type (count vs. mass)	$F(1, 154) = 44.210$, $p < 0.001$
Proficiency level x Noun type	$F(3, 154) = 4.585$, $p < 0.001$
(In)definiteness	$F(1, 155) = 0.242$, $p < 0.623$ (ns)
Proficiency level x (in)definiteness	$F(3, 155) = 1.434$, $p < 0.235$ (ns)

The ANOVA revealed a significant main effect of proficiency level ($p < .001$), confirming that article accuracy varied systematically across the four proficiency groups. There was also a significant main effect of condition ($p < .001$), as well as a significant level × condition interaction ($p < .01$).

These results indicate that the influence of article-noun condition differs across proficiency groups, warranting further analyses to explore the nature of this interaction.

We also tested the effect of noun type (count vs. mass) and found a significant main effect ($p < .001$), as well as a significant level × noun type interaction ($p < .001$). These findings suggest that mass nouns are more difficult overall and that this difficulty increases with lower proficiency. In contrast, the effect of (in)definiteness (definite vs. indefinite) was not significant ($p = .623$), nor was the level × (in)definiteness interaction ($p = .235$), indicating that (in)definiteness alone did not significantly impact accuracy or interact with proficiency level.

To complement the repeated-measures ANOVA analyses, we employed a binomial logistic mixed-effects regression model (GLMM) using the `glmer()` function from the `lme4` package in R. This model predicts the probability of correct article choice (coded as a binary outcome) based on fixed effects of proficiency level, condition, noun type, and (in)definiteness, along with their interactions. The model also includes random intercepts for subjects and items to account for repeated measures within participants and lexical items. The significance of each fixed effect was evaluated using Wald chi-square (χ^2) tests, which compare the fit of the full model with and without each predictor variable. These χ^2 values serve as the GLMM analogue to the F-tests in ANOVA, offering an estimation of effect significance at the trial level while accounting for both subject and item variability. The results are summarized in Table 7.

Table 7. Summary of fixed effects from binomial logistic mixed-effects regression model.

Effect	Wald χ^2 (df)	p-value
Proficiency level	$\chi^2(3) = 103.652$	p < .001***
Condition	$\chi^2(3) = 29.679$	p < .001***
Level × Condition	$\chi^2(9) = 38.007$	p < .001***
Noun type (count/mass)	$\chi^2(1) = 27.908$	p < .001***
Level × Noun type	$\chi^2(3) = 8.066$	p = .045*
(In)definiteness	$\chi^2(1) = 1.027$	p = .311
Level × (in)definiteness	$\chi^2(3) = 16.915$	p < .001***

p values: $p < .05$ = *, $p < .01$ = **, $p < .001$ = ***.

The repeated-measures ANOVA and the GLMM model yielded converging results across nearly all effects of interest. Both models identified highly significant main effects of proficiency level,

condition, and noun type, as well as a robust interaction between proficiency level and condition. Additionally, both models revealed a significant interaction between proficiency level and noun type, albeit with a smaller effect size in the GLMM ($p < .05$). The primary divergence between the two models emerged in the proficiency level × (in)definiteness interaction: while the ANOVA reported this effect as non-significant, the GLMM analysis detected a statistically significant interaction ($\chi^2 = 16.915$, $p < .001$). This discrepancy likely reflects the increased sensitivity of the GLMM framework, which models trial-level data and includes subject and item random effects, thus capturing variance that is averaged out in ANOVA. Overall, the results demonstrate that both statistical approaches converge on the major patterns in the data.[4]

Across group comparisons. To further examine whether L2 learners are statistically distinguishable from native speakers, we present Table 8, which reports the results of a GLMM analysis comparing participant groups. The model first takes native speakers as the reference group and evaluates accuracy in four article–noun conditions across learner groups. This table provides insight into the developmental trajectory of article use in L2 English.

Table 8. Fixed-effects estimates from binomial logistic mixed-effects regression model.

Group	Count–A	Count–The	Mass–Null	Mass–The
Native-like	–1.155 (0.627), z = –1.84, *p* = .165	–0.792 (0.363), z = –2.19, *p* = .077 †	–1.019 (0.360), z = –2.83, *p* = .013 *	–1.633 (0.381), z = –4.29, *p* < .001 ***
Advanced	–2.778 (0.623), z = –4.46, *p* < .001 ***	–0.058 (0.448), z = –0.13, *p* = .994	–1.852 (0.393), z = –4.71, *p* < .001 ***	–2.064 (0.417), z = –4.94, *p* < .001 ***
Intermediate	–3.173 (0.589), z = –5.39, *p* < .001 ***	–1.618 (0.352), z = –4.59, *p* < .001 ***	–2.905 (0.358), z = –8.12, *p* < .001 ***	–2.987 (0.381), z = –7.85, *p* < .001 ***
Constant (NS)	4.258 (0.584) ***	2.233 (0.628) ***	2.229 (0.629) ***	2.568 (0.617) ***

Note. Each column represents a model for a specific article type and noun condition. Coefficients reflect log-odds estimates relative to native speakers (reference group). $p < .05$ = *, $p < .01$ = **, $p < .001$ = ***, † = marginal trend ($p < .10$).

The results reveal distinct accuracy patterns across L2 proficiency levels when compared to native speakers. Intermediate learners show statistically significant differences from native speakers in all four conditions ($p < .001$). This indicates a broad divergence from native-like article use, regardless of noun type or (in)definiteness. Advanced learners, by contrast, performed comparably to native speakers in the Count–The condition ($p = .994$), suggesting improvement with count nouns, but

[4] We thank a reviewer for suggesting the use of a GLMM alongside repeated-measures ANOVA. Incorporating both analytic approaches allowed for a more fine-grained interpretation of the data and strengthened overall results.

remained significantly different in the other three (all $p < .001$). The performance of the native-like learners does not differ from native speakers in the Count–A ($p = .165$) or Count–The ($p = .077$†) conditions, but they show statistically significant differences in the Mass–Null ($p = .013$) and Mass–The ($p < .001$) contexts. This highly restricted contrast suggests that even at very advanced stages of L2 acquisition, article use with mass nouns remains problematic.

We now turn to the results of a GLMM to draw comparisons within the L2 sample. We first focus on comparisons with native-like speakers as the reference group, and then compare advanced to intermediate learners. Table 9 summarizes the results.

Table 9. Results of GLMM comparing L2 groups across four conditions.

Condition	Groups compared	Estimate (SE)	*z*	*p* value
Count–A	Advanced vs. Native-like	–1.574 (0.444)	–3.55	p = .0008 ***
	Intermediate vs. Native-like	–1.964 (0.394)	–4.99	p < .0001 ***
Count–The	Advanced vs. Native-like	+0.732 (0.406)	+1.80	p = .131 (n.s.)
	Intermediate vs. Native-like	–0.821 (0.297)	–2.77	p = .011 *
Mass–Null	Advanced vs. Native-like	–0.843 (0.340)	–2.48	p = .025 *
	Intermediate vs. Native-like	–1.906 (0.297)	–6.42	p < .0001 ***
Mass–The	Advanced vs. Native-like	–0.433 (0.338)	–1.28	p = .339 (n.s.)
	Intermediate vs. Native-like	–1.356 (0.289)	–4.69	p < .0001 ***
Count–A	Intermediate vs. Advanced	–0.370 (0.379)	–0.98	p = .330 (n.s.)
Count–The	Intermediate vs. Advanced	–1.577 (0.414)	–3.81	p < .0001 ***
Mass–Null	Intermediate vs. Advanced	–1.085 (0.354)	–3.07	p = .002 **
Mass–The	Intermediate vs. Advanced	–0.944 (0.354)	–2.67	p = .008 **

*Note***.** The reference group for the first comparisons is the Native-like group; for the second set, Advanced learners serve as the reference. *p* values: $p < .05$ = *, $p < .01$ = **, $p < .001$ = ***.

The results reveal a clear proficiency-based trajectory in article use across noun types and (in)definiteness. When the native-like group is used as the intercept, the advanced group shows significantly lower accuracy than native-like speakers in the Count–A and Mass–Null conditions, with $p = .0008$ and $p = .025$, respectively. However, no significant differences are observed in Count–The or Mass–The contexts, indicating that advanced learners have largely converged with the Native-like group in their use of definite articles. In contrast, the intermediate group performs significantly worse than native-like learners in all four conditions, with the strongest effects observed in Mass–Null and

Mass–The conditions (with $p < .0001$ in both). This suggests that intermediate learners struggle with the (in)definiteness distinctions irrespective of noun type.

When the advanced group is set as the reference level, comparisons with intermediate learners provide further insight into developmental stages. There is no significant difference in Count–A ($p = .330$), implying that intermediate learners have already acquired some competence with indefinite count nouns. However, the intermediate group performs significantly worse in the remaining three conditions: Count–The ($p = .0001$), Mass–Null ($p = .002$), and Mass–The ($p = .008$). These results suggest that definite contexts with count nouns and (in)definite contexts with mass nouns are acquired later. Taken together, across-group comparisons point to a stage-like progression in article acquisition in L2 English: learners first master indefinite articles with count nouns, followed by definite articles with count nouns, and only later acquire target-like performance in the (in)definite contexts with mass nouns.

4. DISCUSSION

The findings of this study confirm that both noun type and proficiency level significantly influence article accuracy in the L2 English of L1-Slavic learners. As Figure 1 shows, accuracy declines in a gradient pattern: first as proficiency decreases, and second as noun type shifts from count to mass. This pattern is consistent with previous research showing that mass nouns pose unique challenges for L2 learners (Inagaki, 2014; Snape, 2008; Yoon, 1993).

In the Count–A condition, learners at all proficiency levels show relatively high accuracy. While substitution of *the* for *a* increases at lower proficiency levels (22% and 26% in Advanced and Intermediate learners, respectively), the target indefinite article *a* remains dominant. This suggests that count-singular contexts with indefinite reference are learned earlier and more robustly, possibly due to their clearer morphosyntactic marking, which may facilitate form-meaning mapping.

The Count–The condition yielded high overall accuracy among the non-native groups (63% to 88% range). Nonetheless, a substitution pattern emerged: learners across all levels occasionally used *a* instead of *the*, with the highest rates observed in Intermediate learners (33%). These results align with previously reported bidirectional substitution patterns in article choice with singular count nouns (e.g., Ionin, Ko & Wexler, 2004; Tryzna, 2009).

Mass noun conditions produced the lowest accuracy scores across the L2 groups, attesting to the difficulty of integrating (in)definiteness with noun type in article use. In the Mass–Null condition, Intermediate learners were particularly inaccurate, correctly selecting the null article only 35% of the time. Their most frequent error—substituting *a* for the null article— reflects overgeneralization of the

singular indefinite marker to contexts where it is ungrammatical. This error pattern is most likely a consequence of miscategorization of some mass nouns as count singular nouns. Overuse of *the* was also observed across all proficiency levels. These findings align with earlier studies showing that L2 learners often misapply article forms in mass noun contexts, particularly when semantic individuation is unclear (Hermas, 2019; Sabir, 2019; Snape, 2008).

The Mass–Null and Mass–The conditions emerged as the most diagnostic in distinguishing native-like from native performance. While native speakers reached 88% and 92% accuracy in the two conditions, native-like learners fell to 75% and 70%, respectively, and substituted the null article 17% of the time and definite article 29% of the time. Importantly, error patterns in the mass noun contexts were bidirectional: learners of all proficiency levels substituted the *null* determiner for *the* and the other way around. In addition, the overgeneralization of *a* to definite mass noun contexts in the Intermediate group suggests miscategorization of some mass nouns as countable, a pattern consistent with Yoon's (1993) findings.

Statistical analyses support these descriptive trends. The ANOVA and GLMM analyses revealed significant main effects of proficiency level, condition, and noun type, along with two key interaction effects: level × condition and level × noun type. These findings confirm that the difficulty of article selection is not uniform across contexts and is particularly sensitive to mass/count distinctions, especially at lower proficiency levels. By contrast, (in)definiteness as a main effect was not significant, suggesting that learners may rely more on noun type and referentiality cues than on (in)definiteness alone.

The GLMM across-group comparisons further illuminate these effects. Using native speakers as the reference group, Intermediate learners showed significant differences in all four conditions, with the most pronounced divergences in the Mass–Null and Mass–The contexts ($p < .001$). Advanced learners also struggled in both mass noun conditions ($p < .001$), especially in the Mass–The context, where substitution of the null article for *the* was frequent (35%). Even Native-like learners diverged significantly from native speakers in both mass contexts, with the strongest effect in Mass–The ($p < .001$), showing that this context remains a persistent challenge. This pattern of progressively narrowing differences across groups supports a stage-like developmental trajectory, in which increased proficiency leads to improved accuracy in count noun contexts, while difficulties with mass nouns—especially those requiring *the*—persist.

Taken together, the analyses converge in showing a significant effect of noun type, confirming that mass nouns present greater difficulty for L2 learners than count nouns. Future research will need to corroborate these findings in larger and more diverse samples of L1-Slavic speakers, with closer

attention to microvariation across Slavic languages, which may contribute nuances to how learners approach English article semantics and form-meaning mappings.

5. CONCLUSION

The current study provides new evidence that L2 learners' article acquisition is shaped by complex interactions among noun type, (in)definiteness, and proficiency. Mass nouns in definite *the* contexts and indefinite contexts requiring the null article pose enduring challenges even for very advanced learners. These findings have implications not only for theories of L2 article acquisition—for example, Ionin, Ko & Wexler's (2004) Fluctuation Hypothesis, which proposes that L2 learners fluctuate between different parameter settings when mapping articles to semantic features such as (in)definiteness and specificity. The results broadly support the idea of fluctuation, showing that it applies not only to *a/the* alternations in count noun contexts, but also to *null/the* alternations in mass noun contexts, thus extending the hypothesis beyond its original scope. This study has pedagogical implications as well: instructional approaches should more explicitly target article use with mass nouns and emphasize the semantic-pragmatic distinctions that underlie their usage.

Future research should continue to explore how semantic, syntactic, and pragmatic features interact to shape article use with mass nouns in L2 English. While the current study highlights clear proficiency-related patterns, further work is needed to disentangle what types of mass nouns (e.g., concrete vs. abstract or atomic vs. non-atomic) are more prone to misclassification and article errors. Additionally, experimental designs incorporating both comprehension and production tasks could offer a more complete view of how learners represent and use articles in mass noun contexts (Snape, 2018). Cross-linguistic comparisons involving learners from articleless languages versus those with article systems could also help refine models of transfer and universal semantic influence.

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