Planning to Perform: Association of Pre-task Strategies with Linguistic Complexity and Cohesion in Argumentative Essays

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Abstract: While much research has examined the effects of pre-task planning on L2 writing performance, little attention has been paid to what writers actually do during planning and how their strategies relate to the linguistic features in their writing. To address these gaps, this study explores the relationship between pre-task planning strategies and language use in L2 argumentative writing. We manually coded 511 timed essays for pre-task strategy use, type, language, and depth of elaboration. The essays were then analyzed for linguistic and cohesion features. Using principal component analysis, we found five constructs tapping into syntactic complexity, lexical complexity, and semantic cohesion. Linear models were used to examine whether pre-task planning and its characteristics predicted variation in these constructs. The results indicated that essays written with one or more pre-task strategies demonstrated significantly higher lexical sophistication. Further, greater elaboration and the use of exploratory or mixed strategies were positively associated with lexical diversity and sophistication. In contrast, no strong relationships were found between planning strategies and syntactic complexity or cohesion. These findings highlight the lexical benefits of pre-task planning and offer implications for research and pedagogy in L2 writing.

Keywords: Syntactic complexity, lexical complexity, cohesion, pre-task planning, prewriting strategies

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1. Introduction

Writing in a second language (L2) is a cognitively demanding process that involves linguistic, discourse, and sociolinguistic knowledge, as well as cognitive and metacognitive strategies (Polio, 2017). This complex nature of writing makes it challenging for many L2 learners to be effective writers, particularly when they have limited command of the target language. With the goal of facilitating language development, scholars have examined how task features influence L2 learners' use. For example, pre-task planning has been explored as a task feature that reduces the cognitive demands of conceptualizing and translating ideas, thereby enabling more effective language use (e.g., Ellis & Yuan, 2004; Johnson et al., 2012; Ong & Zhang, 2010). Most studies have addressed how the availability of planning time affects language use (e.g., Abdi Tabari, 2019; Meraji, 2011; Ong & Zhang, 2010; Rostamian et al., 2018), while some studies have assigned pre-task strategy types to learner groups using a quasi-experimental design (e.g., Johnson et al., 2012) or used retrospective post-writing interviews to identify the strategies used by L2 writers during pre-task planning (e.g., Meraji, 2011). These studies have greatly advanced our understanding of planning time effects, but they have offered little information on how their specific pre-task strategies relate to language use. Thus, in this exploratory study, we aim to examine how the observable pre-task planning products relate to L2 writing outcomes. Importantly, by analyzing naturally occurring written planning products from a high-stakes placement exam, this study prioritizes ecological validity and offers insights into authentic L2 writing processes.

2. Literature review

2.1 Planning time as task variable

Over the past two decades, L2 writing studies have explored how task-internal cognitive demands affect written language use and examined the validity of several task complexity variables (e.g., Ellis & Yuan, 2004; Frear & Bitchener, 2015; Johnson et al., 2012; Kormos, 2011; Kuiken & Vedder, 2008; Ong & Zhang, 2010; Rйvйsz et al., 2017, among others). Planning time is one of the variables that has been widely studied for its potential to ease cognitive demands and activate linguistic resources during the act of writing. Previous studies have shown that pre-task planning relates to learner language use. For instance, Johnson's (2017) meta-analysis found that learners with planning time demonstrated greater syntactic complexity and accuracy. Abdi Tabari (2019) also reported that planning time positively affected linguistic features across different writing tasks (personal, narrative, and decision-making). These findings may suggest that the reduced attentional demands provided by planning time enable L2 writers to allocate more resources to language

formulation and produce more complex language. Still, this study does not treat complexity as a direct indicator of development, recognizing that increased complexity does not necessarily correspond to greater effectiveness or genre appropriateness (Bultй & Housen, 2012; Durrant et al., 2020).

Nevertheless, the effects of pre-task planning are not always consistent. Ellis and Yuan (2004) asked L2 learners to write a picture narrative essay under different planning conditions (pre-task planning, online planning—no time limit for writing, and no planning). They found that while pre-task planning (10 minutes) increased complexity and fluency, it had little effect on accuracy. Using the same picture narrative prompt and planning condition, Rostamian et al. (2018) reported that pre-task planning only improved one fluency measure (syllables per minute) and did not lead to significant changes in the other linguistic measures. Ziegler (2018) investigated pre-task planning effects on language use in synchronous computer-mediated communication and discovered that planning time led to more diverse lexical item use but did not significantly affect syntactic complexity, accuracy, or fluency.

These mixed results suggest that the benefits of pre-task planning on linguistic measures are not uniform across studies. Ong and Zhang (2010) observed that planning time negatively impacted fluency and lexical complexity, while Johnson et al. (2012) found minimal or no impact on fluency and complexity. Abrams and Byrd (2016) even noted lower grammatical and lexical accuracy with planning time among first-year German learners. However, it is important to note that many of these studies operationalize the multi-faceted constructs of syntactic and lexical complexity in different ways. Variability in findings may also result from differences in study design (e.g., learner proficiency levels, genres, or specific planning conditions). Thus, the view of conflicting findings may in part reflect a lack of alignment in methodological decisions rather than true contradictions. In this regard, Ellis and Yuan (2004) emphasized the need for "probing more deeply what L2 writers actually do when they engage in pre-task and on-line planning" (p. 82), highlighting the importance of going beyond planning time alone to explore the qualitative nature of planning itself.

2.2 Pre-task planning strategies and language use

While much previous research has focused on the provision of planning time as a task variable (i.e., planning time or no planning time), relatively fewer studies have examined the specific planning strategies L2 writers use and how those strategies relate to textual outcomes. Early work by Kellogg (1990) tested how two pre-task writing strategies (i.e., clustering and outlining) influenced first language (L1) college student writing. Results showed that clustering increased idea generation, while outlining significantly improved fluency. Rau and Sebrechts (1996) also found that outlining enhanced fluency in writing. Kellogg's (1996) cognitive model of

writing may explain these findings, as it posits that writing involves recursive formulation, execution, and monitoring processes, which compete for limited attentional resources. From this perspective, the use of pre-task strategies can reduce cognitive load, thus allowing writers to allocate more attention to idea generation and language formulation. These predictions are relevant to L2 writing, where formulation places heavier cognitive demands due to additional burdens in planning and lexical encoding (Johnson, 2017).

In L2 contexts, several studies have explored how adult ESL learners engage in pre-task planning. For example, Shi (1998) compared the effects of teacher-led and peer discussions on writing performance and found that learners who engaged in prewriting produced more organized texts with higher lexical diversity, even though the no-planning group wrote longer essays. Similarly, Johnson et al. (2012) examined how pre-task planning strategies affected syntactic complexity, fluency, and lexical complexity in L2 writing. Randomly assigned to one of the five pre-task conditions, adult EFL students were asked to plan their writing using one of the assigned strategies and then to write an argumentative essay. The pre-task strategies included idea generation (listing), organization (outlining), goal setting, and a mixture of goal setting and organization, and the students were allowed 40 minutes to complete a writing task (10 min for pre-task planning and 30 min for writing). Their findings indicated that pre-task strategies, when operationalized as isolated treatments, did not significantly improve complexity or fluency, suggesting that strategy instruction alone may not lead to more complex language.

On the other hand, Khezrlou (2020) focused on the learnability of planning behaviors in L2 writing. In that study, learners were given a 45-minute training that involved what to remember during pre-task planning (e.g., avoiding grammar focus; planning specific details), and their narrative essays composed before and after the training were compared. The study noted that the learners generally showed increased positive planning behaviors and reduced negative behaviors after the training, and that their post-training essays showed increased complexity and fluency when compared with their pre-training essays (no significant difference in accuracy). In discussing negative planning behaviors, Khezrlou pointed out that the students relied too frequently on their L1 during pre-task planning but that they could reduce their L1 use through the training step. However, as Friedlander (1990) argued, generating ideas in one's L1 can in fact be beneficial, particularly when it supports robust content development.

These mixed findings underscore the need for more nuanced examinations of what writers actually do during pre-task planning and how specific planning strategies, as reflected in observable planning products, relate to sentence- and discourse-level features. One such discourse-level feature is cohesion, defined as the degree of linguistic and conceptual links across segments of a text. While syntactic and lexical complexity reflect development at the sentence level, cohesion

offers insight into how writers integrate ideas across larger stretches of discourse (Yang & Sun, 2012). Previous studies have shown that different types of cohesive devices are not equally predictive of writing quality. Local cohesion features (e.g., connectives) often show weak or negative correlations with expert ratings of essay quality, while global cohesion (e.g., semantic similarity across paragraphs) tends to be more positively associated with overall quality (Crossley & McNamara, 2010, 2011; Crossley et al., 2016).

Some recent research has highlighted the influence of pre-task planning on cohesion. For example, Abdi Tabari and Golparvar (2024) examined how planning time and topic familiarity affected the use of cohesive devices in L2 writing. Their results showed that while the use of connectives decreased under planning conditions, semantic overlap at both the sentence and paragraph levels increased, suggesting that planning may promote deeper conceptual linkage across discourse. Zhang (2018) found that strategic planning training had limited impact on the use of textual cohesive devices but enhanced learners' awareness of cohesion and helped them better regulate their attentional focus during writing. These studies suggest that although planning may not uniformly improve all dimensions of cohesion, it may foster more coherent organization of ideas in L2 writing. Building on this line of research, the present study examines how pre-task planning relates to linguistic resources that reflect the communicative demands of argumentative writing. Because argumentative writing requires writers to articulate claims, justify positions, and anticipate counterarguments, we focus on constructs that align with these rhetorical functions (Biber & Conrad, 2009). Lexical diversity and sophistication capture the breadth and maturity of writers' lexical choices that support nuanced elaboration of ideas. Syntactic complexity indices represent writers' ability to use varied structural units to construct persuasive reasoning. Cohesion measures reflect how writers connect propositions through referential and logical links. Together, these indices provide a comprehensive view of linguistic resources that underlie effective argumentation (Crossley, 2020).

Proficient writers are expected to have developed the ability to engage in pre-task planning, but their preferences and strategies can vary widely. Therefore, examining how planning is performed in high-stakes writing contexts can yield valuable suggestions. Unlike previous studies that randomly assigned participants to pre-task conditions, the present study takes an exploratory approach to investigate the actual strategies L2 writers employed when they were encouraged to plan before composing under testing conditions. In addition to identifying strategy type, this study also examines the depth of elaboration (i.e., the degree to which ideas were developed during planning). Comparing the essays of students who did not plan, planned, or extensively planned, Gillis and Olson (1990) found that students who planned had higher writing scores than students who did not plan, but students who extensively planned performed better overall. Chai (2006)

also examined planning features and found that the depth of elaboration during planning was associated with higher writing scores. Despite its pedagogical relevance, elaboration has been understudied in L2 contexts. Building on these findings, we aim to explore how both the type and depth of planning, along with language choice, relate to sentence-level complexity and discourse-level cohesion in L2 writing. To this end, we address the following research questions:

1. How does the use of pre-task planning strategies relate to linguistic features and semantic cohesion in L2 argumentative writing?
2. How do the characteristics of pre-task planning strategies (strategy type, depth of elaboration, and language choice) relate to linguistic features and semantic cohesion in L2 argumentative writing?

3. Methods

3.1 Data

We collected data from an ESL placement test administered at a four-year research university in the United States. The test was required for all transfer undergraduate students and graduate students who were L2 users of English. It was a high-stakes test that could increase the number of units required for graduation or delay their progress towards a degree, as students might be required to take up to three ESL classes based on their performance. All students taking the exam had a minimum IELTS score of 7.0 or TOEFL iBT score of 83, the minimum scores for university applicants. Thus, they can be considered L2 learners at an intermediate-high or advanced proficiency level.

We analyzed 511 essays administered to 463 graduate and 48 undergraduate students throughout the 2012-2013 academic year. The students were given one hour to read the prompt and write an argumentative essay on paper. They selected one of the two given topics to develop their writing: (A) people's communication of information through their clothes and (B) the negative value of competition (see Appendix A for the full prompt). The two topics were included in the prompt to reduce the potential effect of topic familiarity and to allow students to select a topic that aligns more closely with their background knowledge and experience. Particularly relevant to this study is that the students were encouraged to use the back of the first page to prewrite, as noted in the last sentence of the instructions, "You may use the back of this page for making notes and planning your answer." These open-ended directions for pre-task planning reflect real-life academic writing conditions, allowing students to draw on planning strategies with which they are already familiar. This approach enabled us to capture a wide range of naturally occurring planning products. Approximately 57% of the students (n =

291) indeed prewrote, using the back of the first page or the margins on the first page. The hand-written essays were transcribed for text analysis.

3.2 Analysis

Pre-task planning strategy coding

We adapted Hyland's (2003) categories of planning strategies based on the strategies observed in the data and used the following types of prewriting for coding: (a) outlining, (b) listing, (c) drafting, and (d) other, which included freewriting, webbing/clustering, and scribbling among others. Examining what each writer wrote on the back of the first page, we manually identified the types and features of their pre-task planning strategies, and we checked inter-coder reliability (see below for details). *Outlining* was defined as an organized list of ideas, which later transferred to respective paragraphs in the final product. They often included subordination to indicate the intended use of supporting details. While outlining traditionally refers to a vertical list of information in a particular sequence, we regarded as outlines some instances that were not vertical but corresponded to the essay structure. *Listing* was defined as the listing of details for an essay topic. Unlike outlining, the order of the listed ideas in this strategy did not necessarily match the structure of an essay. Another distinction between outlining and listing was that the latter did not have any entry involving subordination. *Drafting* was defined as continuous prose in which the writer has transferred much of what they wrote to the final product (see Appendix B for pre-task planning strategy examples). While the draft needed not be a full draft, for the prewriting to count as drafting, the portions drafted must have been similar in wording and structure to the final product[1]. Webbing/clustering was a strategy to show connections between ideas by linking them using lines.

Additionally, the strategies were categorized into non-mixed and mixed types; the majority of the mixed type (n = 35 out of 53) were a combination of listing and outlining. The essays were coded for the language used for pre-task planning: L1, L2 (English), and both. Last, the level of elaboration for each prewriting was coded on a continuous scale from 1 (low) to 3 (high), depending on the degree of detail and development. Figure 1 shows examples of the outlining strategy that were coded as having low, mid, and high levels of elaboration. Figure 1(a) is an example of the low level of elaboration; it has a clear structure of an outline for the whole essay, but it only has topics written in single words for each paragraph without supporting detail. Other examples in this group also include short phrases. Figure

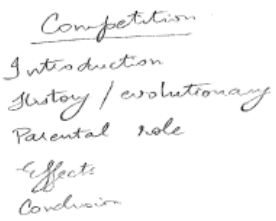
[1] This was where *drafting* mainly differed from *freewriting*; the instances coded as *freewriting* were notably different in wording and structure from the final product.

1(b) is an outlining example with the mid-level of elaboration, as it exhibits the main characteristics of an outline, such as a main idea for each paragraph in phrases and list of supporting examples. The supporting examples are single words or short phrases without further development. Figure 1(c) is an example of the high-level of elaboration. It is characterized by extensively developed main ideas and subordinated ideas. Based on this coding scheme, two of the authors of this research participated as pre-task strategy coders. They double coded 20% of the essay data (n = 100) for strategy type, depth of elaboration, and language used for pre-task planning. Inter-coder reliability assessed using Cohen's kappa was found to be acceptable (kappa = .82), and all discrepancies were resolved through discussion. The remaining essays were coded by each of the coders individually. Table 1 is a summary of the strategy coding result.

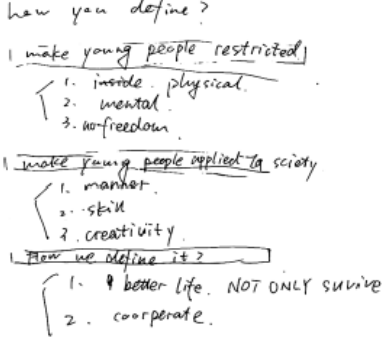
Table 1. Summary of the pre-task planning strategy coding result

Planning strategy condition	*n*
Pre-task planning	291
Non-mixed	
Outlining	119
Listing	76
Drafting	17
Other	26
Mixed	
Listing + Outlining	35
Other mixed	18
No pre-task planning	220

(a) Low level of elaboration



(b) Mid level of elaboration



(c) High level of elaboration

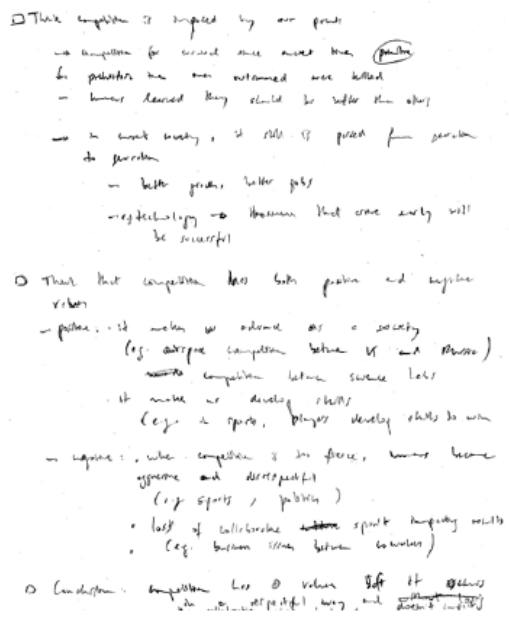


Figure 1: Outlining examples with three different levels of elaboration.

Linguistic measures and data analysis

We computed syntactic complexity measures by using Lu's Syntactic Complexity Analyzer (SCA; Lu, 2010). Of the 14 SCA measures, we decided to include five syntactic complexity measures based on the criteria of construct distinctiveness, redundancy, and validity. For multiple measures known to tap into a very similar construct (e.g., complex nominals per sentence and complex nominals per clause), we included only one measure having the clause as its basis following earlier studies. Also, we excluded measures (e.g., verb phrases per T-unit, complex T-units per T-unit, T-units per sentence) that had been found to function less validly as proficiency indicators (Ai & Lu, 2013; Lu, 2011). As a result, this study includes two unit-length measures (mean length of sentence (MLS) and mean length of clause (MLC)), one subordination measure (clauses per T-unit (C/T)), and two phrase-level measures (coordinate phrases per clause (CP/C) and complex nominals per clause (CN/C)).

We computed five lexical complexity measures using the Lexical Complexity Analyzer (Lu, 2012) and the *koRpus* package (Michalke, 2018) in R. Lexical sophistication, generally defined as "the proportion of relatively unusual or advanced words in the learner's text" (Read, 2000, p. 203), was targeted using the number of sophisticated lexical words per total lexical words (Lexical sophistication 1; Hyltenstam, 1988), the proportion of the number of sophisticated word types to total word types (Lexical sophistication 2; Laufer, 1994), and sophisticated verb types per the square root of twice the total number of verbs (Corrected verb sophistication; Wolfe-Quintero et al., 1998). We used three indices to assess lexical diversity: the measure of textual lexical diversity (MTLD), D, and the corrected type-token ratio (the ratio of word types to the square root of twice the total number of words). These multiple indices were included to triangulate the construct, as each measure accounts for text length differently and captures slightly distinct aspects of lexical variation (Lu, 2012; McCarthy & Jarvis, 2010). While we acknowledge that these measures are moderately correlated, their combined use allows for a more robust interpretation of lexical diversity.

To assess text cohesion, we used the Tool for the Automatic Analysis of Cohesion 2.0 (TAACO 2.0; Crossley et al., 2016, 2019). While this tool provides a multitude of indices of local and global cohesion, we specifically targeted four semantic cohesion indices that capture conceptual overlap across the text (word2vec and LSA cosine similarity between adjacent sentences, and between adjacent paragraphs). We prioritized these semantic similarity indices over surface-level cohesion features (e.g., connectives or pronoun overlap) because they offer a deeper representation of cohesion (see Crossley et al., 2019 for a detailed explanation). These indices reflect the degree to which lexical items in one segment are semantically related to those in neighboring segments, and they have been shown to predict human ratings of text cohesion. Appendix C presents the

descriptive results of all linguistic measures. In total, 15 indices were selected for analysis, providing broad coverage of relevant linguistic constructs while minimizing redundancy.

We examined the correlation matrix among all linguistic indices. As expected, several measures showed substantial collinearity. For instance, MTLD and D had a correlation coefficient of .78. To account for this redundancy and improve the interpretability of our analysis, we conducted principal component analysis (PCA). This approach allowed us to capture broader underlying constructs (e.g., lexical sophistication, cohesion) without overweighting individual features. We used a PCA with oblique rotation (direct oblimin), which is viewed as the most suitable type for SLA data (Loewen & Gonulal, 2015). We confirmed the appropriateness of the data for PCA (KMO: 0.70; Barlett's test: $\chi 2$ (105) = 4,952, $p < .001$). The result of the PCA with Kaiser's criterion extracted five composites, accounting for 76.88% of the variance in all measures. Table 2 displays the factor loadings obtained from a pattern matrix and the communalities (h^2) for the four composites. All loadings greater than .50 were considered meaningful and thus highlighted in the table. The five composites were labelled to reflect the factor loading patterns of the linguistic measures (i.e., syntactic complexity, *lexical sophistication, sentence length, lexical diversity*, and *cohesion*), and they were used as the outcome variables for multilevel modeling.

Table 2. Factor loadings for linguistic and cohesion measures

Measures	Composites				
	Lexical sophistication	Syntactic complexity	Lexical diversity	Cohesion	Sentence length
MLS	047	.463	.040	.046	.764
MLC	.051	.932	.061	.052	-.093
C/T	.046	-.340	-.014	-.017	.918
CP/C	.002	.729	.070	-.082	-.055
CN/C	.215	.763	-.035	-.068	.009
D	-.0843	-.002	.959	.025	.006
MTLD	-.018	.007	.921	-.016	.024
CTTR	.284	.050	.687	-.060	-.011
LS1	.880	.077	-.034	-.130	.023
LS2	.898	.083	-.010	-.042	.003
CVS	.772	-.042	.134	.243	.081
W2V_Sent	-.139	.246	-.061	.695	.275
W2V_Para	.208	-.127	.010	.731	-.209
LSA_Sent	-.224	.119	-.155	.559	.294
LSA_Para	-.035	-.087	.023	.890	-.072
Eigenvalues	4.59	2.67	1.77	1.42	1.09
% of variance	30.57	17.79	11.79	9.48	7.25

Note. Extraction method: principal component analysis; Rotation method: direct oblimin with Kaiser normalization.

Linear models were built in R to examine the relationships between pre-task planning and L2 writing outcomes. We constructed a model for each textual construct as a unique outcome variable (five constructs in total) and added topic in the models as a predictor to control for potential topic effects. Instead of including any random intercepts, we added student grade level (graduate or undergraduate) as a fixed effect to account for potential differences in writing ability. The models for the first research question included pre-task strategy use (yes or no) and topic (A or B) as fixed effects, with the level of "yes" indicating that a student used one or more pre-task strategies regardless of strategy type. The models for the second question included strategy type (listing, outline, drafting, other, listing + outline, or other mixed), depth of elaboration (1-6), language choice (L1, L2, or both) and topic. We also fit an interaction between strategy type and elaboration depth to measure how different strategies, depending on the level of elaboration, influenced language use.

4. Results

To address the first research question, we fit linear models with *pre-task strategy use, topic*, and *grade level* as fixed effects. As shown in Tables 3 and 4, pre-task planning was associated with greater sentence length (b = 0.19, SE = 0.09, t = 2.06, p = .039) and lexical sophistication (b = 0.23, SE = 0.09, t = 2.68, p = .008), often linked to dense information packaging in writing. These results suggests that L2 writers who used one or more prewriting strategies tended to produce longer sentences and more sophisticated vocabulary. However, pre-task planning was not significantly related to measures of deeper semantic cohesion (b = -0.01, SE = 0.08, t = -0.18, p = .859), lexical diversity (b = -0.02, SE = 0.08, t = 0.23, p = .821), or syntactic complexity (b = 0.16, SE = 0.09, t = 1.75, p = .080), indicating that surface-level expansions did not necessarily entail greater cohesive or structural elaboration.

Table 3. Multilevel models of phrasal and clausal complexity, as predicted by prewriting strategy use

	Syntactic complexity			Sentence length		
	b	SE	*t*	*b*	SE	*t*
(Intercept)	-0.069	0.085	-0.814	-0.055	0.085	-0.646
Prewriting: Yes	0.156	0.089	1.753+	0.185	0.090	2.064*
Topic: B	0.038	0.088	0.435	-0.070	0.089	-0.789
Grade: Undergrad	-0.431	0.151	-2.854**	-0.134	0.152	-0.881

Note. Baselines for categorical variables: Prewriting = No, Topic = A, Grade = Graduate; ** p < .01; * p < .05; + p < .10

Table 4. Multilevel models of lexical complexity, as predicted by prewriting strategy use

	Lexical sophistication			Lexical diversity			Cohesion		
	b	SE	*t*	*b*	SE	*t*	*b*	SE	*t*
(Intercept)	0.009	0.083	0.108	-0.011	0.083	-0.136	-0.509	0.075	-6.754**
Prewriting: Yes	0.234	0.087	2.683**	0.020	0.087	0.227	-0.014	0.079	-0.178
Topic: B	-0.152	0.086	-1.764	0.138	0.086	1.601	0.956	0.078	12.214**
Grade: Undergrad	-0.644	0.148	-4.336**	-0.792	0.148	-5.340**	0.023	0.134	0.173

Note. Baselines for categorical variables: Prewriting = No, Topic = A, Grade = Graduate; ** p < .01; * p < .05; + p < .10

The second research question concerned the individual characteristics of pre-task planning strategies: strategy type, elaboration depth, and language choice. Table 5 presents the models in which syntactic complexity and sentence length were used as outcome variables, while Table 6 reports the models for lexical sophistication,

lexical diversity, and cohesion. The models indicated that the type of language used for planning (L1, L2, or both) did not significantly relate to any of the five textual constructs. With regard to strategy type, participants who employed other strategies (e.g., webbing or scribbling) showed significantly higher lexical sophistication than those who used drafting (b = 1.78, SE = 0.82, t = 2.18, p = .030). The use of other mixed strategies also predicted greater lexical diversity (b = 2.39, SE = 0.96, t = 2.49, p = .014). These results may indicate that certain exploratory planning strategies many encourage broader or more sophisticated lexical use.

Table 5. Multilevel models of syntactic complexity, as predicted by prewriting strategy type, elaboration depth, and language

	Syntactic complexity			Sentence length		
	b	SE	t	b	SE	t
(Intercept)	-0.255	0.798	-0.320	-0.363	0.807	-0.450
Type: Listing	-0.155	0.747	-0.207	0.697	0.755	0.924
Type: Outline	-0.467	0.741	-0.631	0.754	0.749	1.006
Type: Other	0.311	0.824	0.377	1.297	0.833	1.556
Type: Listing + Outline	-0.610	1.022	-0.597	1.021	1.033	0.988
Type: Other mixed	-0.904	1.049	-0.862	1.041	1.060	0.982
Depth	0.141	0.324	0.434	0.352	0.328	1.074
Language: L2	0.396	0.335	1.183	-0.235	0.338	-0.693
Language: Both	0.148	0.382	0.389	-0.293	0.386	-0.761
Depth*Type: Listing	-0.061	0.346	-0.177	-0.293	0.350	-0.837
Depth*Type: Outline	0.061	0.350	0.173	-0.277	0.354	-0.782
Depth*Type: Other	-0.275	0.396	-0.696	-0.630	0.400	-1.575
Depth*Type: Listing + Outline	-0.013	0.370	-0.034	-0.459	0.374	-1.228
Depth*Type: Other mixed	0.049	0.372	0.133	-0.321	0.376	-0.854
Topic: B	0.072	0.122	0.589	-0.261	0.123	-2.125*
Grade: Undergrad	-0.455	0.242	-1.881+	-0.236	0.245	-0.966

Note. Baselines for categorical variables: Type = Drafting; Language = L1, Topic = A, Grade = Graduate; ** $p < .01$; * $p < .05$; + $p < .10$

Table 6. Multilevel models of lexical complexity, as predicted by prewriting strategy type, elaboration depth, and language

	Lexical sophistication			Lexical diversity			Cohesion		
	b	SE	*t*	*b*	SE	*t*	*b*	SE	*t*
(Intercept)	-1.712	0.793	-2.160*	-1.688	0.732	-2.306*	-0.614	0.654	-0.939
Type: Listing	1.343	0.742	1.811+	1.281	0.685	1.871+	0.290	0.612	0.473
Type: Outline	1.383	0.736	1.879+	0.993	0.680	1.460	0.062	0.608	0.102
Type: Other	1.784	0.819	2.179*	1.190	0.756	1.574	0.091	0.676	0.135
Type: Listing + Outline	1.074	1.015	1.058	0.800	0.937	0.854	0.668	0.838	0.797
Type: Other mixed	1.908	1.042	1.832+	2.390	0.962	2.485*	-0.906	0.860	-1.054
Depth	0.758	0.322	2.355*	0.562	0.297	1.892+	-0.082	0.266	-0.309
Language: L2	0.163	0.333	0.491	0.424	0.307	1.381	0.051	0.274	0.184
Language: Both	-0.079	0.379	-0.209	0.388	0.350	1.110	-0.034	0.313	-0.110
Depth* Type: Listing	-0.503	0.343	-1.466	-0.511	0.317	-1.612	-0.039	0.283	-0.138
Depth* Type: Outline	-0.587	0.348	-1.686+	-0.426	0.321	-1.326	0.082	0.287	0.285
Depth* Type: Other	-0.701	0.393	-1.784+	-0.347	0.363	-0.957	0.096	0.324	0.296
Depth* Type: Listing + Outline	-0.589	0.367	-1.603	-0.441	0.339	-1.299	-0.114	0.303	-0.374
Depth* Type: Other mixed	-0.759	0.369	-2.055*	-0.886	0.341	-2.598**	0.290	0.305	0.950
Topic: B	-0.048	0.121	-0.396	0.110	0.112	0.985	1.039	0.100	10.416**
Grade: Undergrad	-0.685	0.240	-2.848**	-0.663	0.222	-2.988**	-0.137	0.198	-0.691
(Intercept)	-1.712	0.793	-2.160*	-1.688	0.732	-2.306*	-0.614	0.654	-0.939

Note. Baselines for categorical variables: Type = Drafting; Language = L1, Topic = A, Grade = Graduate; ** $p < .01$; * $p < .05$; + $p < .10$

In terms of elaboration depth, participants who used more developed planning tended to show increased lexical sophistication ($b = 0.76$, SE = 0.32, $t = 2.36$, $p = .019$), and it also had a marginally significant relationship with lexical diversity ($b = 0.57$, SE = 0.30, $t = 1.89$, $p = .060$). This finding supports the notion that more elaborative planning may facilitate lexical access and variation in writing although its effect on syntactic or cohesion-related features was limited. Several interactions between strategy type and elaboration depth approached significance, indicating that in some cases, increased elaboration may not enhance effectiveness uniformly across all strategy types.

Extracts 1 and 2 illustrate how the essays written by two L2 writers of similar proficiency and educational background differed in lexical sophistication. Both essays responded to the same prompt on the negative value of competition (Topic B) and received comparable quality scores. Extract 2 is accompanied by the actual pre-task planning product (see Figure 2). In these examples, the essays written with pre-task planning (Extract 2, elaboration depth 6) contains a greater number of advanced, low-frequency vocabulary items compared to the essay written without planning (Extract 1). For instance, Extract 2 includes several less common words or phrases (e.g., *negative consequences, imposed, genesis, overly estimated, social scientists*) that do not appear in Extract 1. These differences illustrate the higher lexical sophistication of the planned essay, consistent with our quantitative findings.

Extract 1: *No pre-task planning, elaboration depth 0 (Topic B; ID 172)*

"It is the truth that all around the world, no matter what the culture is in one country, parents would like to do whatever to help children grow healthily and successfully. To me, who was born and raised up in China, I oppose the topic which regards that competition plays a negative role on children. Since I grow up facing a lot of competition set by my parents and now I have successfully become a new graduate student in UCLA, the competition has great influence on me. In order to be successful in the future, one has to be outstanding among thousands, even millions of people, which is also our parents' thoughts."

Extract 2: *With pre-task planning, elaboration depth 6 (Topic B; ID 347)*

"Nowadays the question of positive and negative consequences (and causes) of competition values imposed on children by parents is on debate. In my essay I give a set of possible explanations of competition values social genesis and provide some evidence that negative effects of the competition are overly estimated. The text is organized as follows: In the first section I describe views of different social scientists on the role of competition in social and personal development. Next I analyze differences of competition values in developed and developing countries."

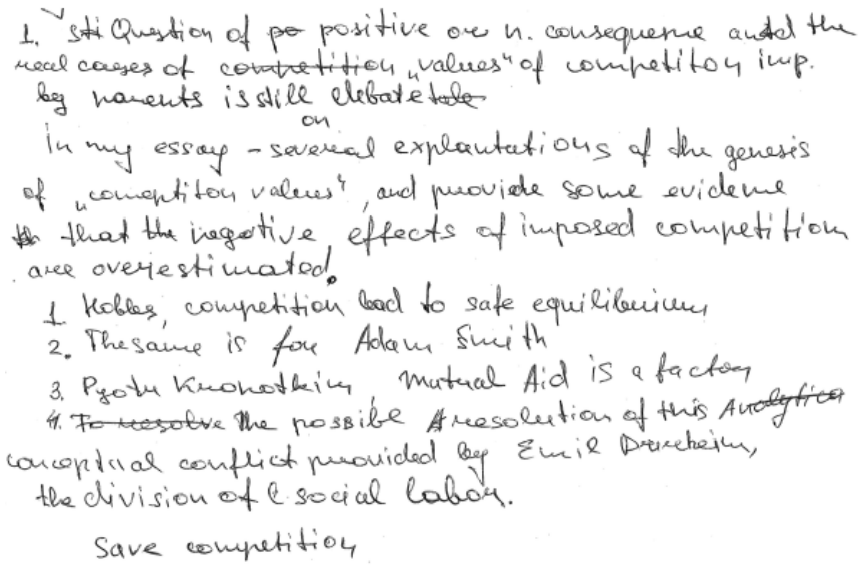


Figure 2: Pre-task planning used with an extract 2 essay

5. Discussion

First, we found that the essays written with one or more pre-task strategies showed greater lexical sophistication than those without any pre-task strategy. This finding may indicate that certain strategies employed during the planning stage allow L2 writers to build their ideas and search for relevant lexical items (Ortega, 2005), leading to the use of more sophisticated words in timed writing. This lexical enhancement may reflect a broad pattern of information packaging and efficient meaning making through advanced lexical items, which is generally associated with academic writing. This planning advantage aligns with cognitive models of writing, which propose that pre-task planning reduces cognitive load and frees attentional resources for lexical selection (Kellogg, 1996). That is, L2 writers can be effectively encouraged to use more sophisticated lexis and package information more densely through pre-task planning. However, we did not find significant relationships between pre-task planning use and other linguistic features, such as syntactic complexity, lexical diversity, or semantic cohesion. This may suggest that while planning supports lexical retrieval at the word level, it does not appear to influence syntactic structuring or discourse-level meaning integration.

We then examined how specific features of pre-task strategy were linked to language outcomes. Most notably, learners who used their pre-task strategies in greater detail tended to show increased lexical sophistication and, to a lesser extent, lexical diversity. This may indicate that the degree of detail during pre-task planning is conducive to the activation and retrieval of relevant lexical items, making more sophisticated words available for L2 learners to use in their writing. While lexical complexity has been found to be a multi-faceted construct involving sophistication, diversity, and density (Lu, 2012; Verspoor et al., 2012), our findings suggest that more elaborated planning may help learners engage with these multiple dimensions. Pedagogically, this implies that teachers should encourage not just the use of pre-task planning, but also guide students to develop their ideas in greater depth.

While the depth of elaboration was found to be the pre-task strategy feature most consistently linked to lexical outcomes, we also observed that some types of strategies were more effective than others in eliciting texts with greater lexical diversity. Specifically, the mixed use of freewriting, webbing and/or scribbling resulted in essays with greater lexical diversity than drafting. Moreover, planning strategies categorized as "other" were positively associated with lexical sophistication. These findings suggest that exploratory planning techniques may encourage idea generation that results in varied and sophisticated lexical choices, as reflected in the validated indices of lexical complexity (Lu, 2012; Wolfe-Quintero et al., 1998). While L1 use was discussed as one of the negative planning behaviors in L2 writing (Khezrlou, 2020), we found that pre-task language choice was not significantly related to the linguistic features of writing. Together, our findings offer evidence that prewriting can be targeted in L2 writing instruction depending on the learner's needs and goals. For example, learners who struggle with lexical access during writing may benefit from the use of mixed pre-task strategy types that stimulate lexical retrieval.

It has been widely accepted that lexical development tends to take place in the early stages of L2 development, followed by syntactic development (Verspoor et al., 2012). Thus, it seems to be appropriate to include pre-task planning strategies as a pedagogical target for L2 learners at novice or intermediate proficiency levels, together with other techniques that aim to promote syntactic changes. To this end, in line with the writing-to-learn language approach (see Manchyn, 2011), L2 writing instructors can design writing tasks in ways that learners can make full use of their syntactic repertoires. For example, genre and topic, which have been revealed as writing task factors that consistently influence syntactic complexity (e.g., Lu, 2011; Kessler et al., 2022), can be chosen in consideration of learners' developmental level.

Regarding syntactic complexity, the present study did not find strong evidence that pre-task strategy dimensions were associated with syntactic or cohesion features. This suggests that although the varied use of pre-task planning strategies

may support learners in generating complex ideas, their impact appears to be largely confined to the lexical level. That is, regardless of the use of pre-task strategies, all L2 learners completed the same argumentative writing task with fixed communicative demands. This may support the view that syntactic complexity is closely tied to genre-specific communicative functions (Biber & Conrad, 2009; Yoon & Polio, 2017), which remained constant in this study. Topic had a small effect on sentence length in one of the models, but it showed a significant effect on semantic cohesion. This finding suggests that even within one genre, topic selection may influence how L2 writers organize and connect ideas at the discourse level. The results also revealed that grade level was a consistent predictor of both syntactic and lexical complexity, with undergraduate students producing essays that were significantly less complex than those of graduate students. Therefore, it is essential that genre, topic, and learner background be carefully accounted for when investigating language development in L2 writing research (Polio & Park, 2016).

6. Conclusion

This study explored how L2 writers' use of pre-task planning strategies relates to linguistic features in argumentative writing. The results revealed a significant relationship between pre-task planning and lexical sophistication and further showed that specific characteristics of planning were associated with increased lexical diversity and sophistication. These findings underscore the potential of prewriting strategies to enhance L2 learners' vocabulary development. From a pedagogical standpoint, the findings suggest that L2 writing instruction may benefit from explicitly targeting the effective use of pre-task planning strategies, particularly those that encourage elaboration and lexical exploration. When equipped with the opportunity to retrieve and organize ideas through planning, learners may be better prepared to incorporate less frequent, academically oriented words into their writing. However, we note that these linguistic enhancements should not be over-interpreted as holistic improvements in proficiency. The complexity and cohesion indices used in this study serve as useful indicators of language use and development , but they do not equate to overall proficiency gains.

While the study offers valuable pedagogical implications, several limitations must be acknowledged. First, to pursue research with high ecological validity, we did not use an experimental design that assign learners to specific planning conditions; instead, we analyzed placement essays in which learners were encouraged to engage in pre-task planning using strategies they were already familiar with. As a result, our findings cannot establish causal links between strategy use and language outcomes. Additionally, it is possible that some students engaged in mental planning or used prewriting elsewhere, which may not have been captured by our data collection method. Future studies employing controlled experimental designs will be essential to confirm these findings. Moreover, the

relatively limited link between pre-task strategies and syntactic or cohesion-related features indicates that future research should investigate potential interactions between planning and task characteristics such as genre (e.g., identifying strategies effective for different genres). It is important to acknowledge that this study focused exclusively on argumentative writing, and as such, the findings may not generalize to other genres with different rhetorical demands. Similarly, because the participants were predominantly intermediate-high to advanced L2 learners, the results may not fully capture how less proficient writers engage in pre-task planning. Future studies could broaden the scope to include a wider range of genres and proficiency levels.

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Appendix A

Writing Prompts

You will have 60 minutes to plan, write, and revise a formal academic composition on one of the two topics on the last page. Choose only one of the topics on page 5 for your composition. Use examples from your own experience or from any reading you have done to support and explain your ideas. Your composition will be evaluated on linguistic control (grammar, expression, and word choice) and your ability to express your ideas clearly and accurately in academic English. You may use the back of this page for making notes and planning your answer and the lined pages for your composition.

Topic A

For thousands of years human beings have first communicated with one another in the language of clothes. Long before I am near enough to talk to you, you announce your age, sex, and class to me through what you are wearing, as well as information – or miscommunication – about your occupation, origins, personality, opinions, tastes, and current mood. I register this information unconsciously, and your simultaneously do the same for me. By the tie we meet, we have already spoken to each other in the language of clothes. [adapted from Alison Lurie, "The Language of Clothes"]

Assignment: What is your view on the idea that people communicate important information about themselves through their clothes? In your essay, support your position by discussing an example (or examples) from literature, the arts, science and technology, politics, sports, current events, or your experience or observation.

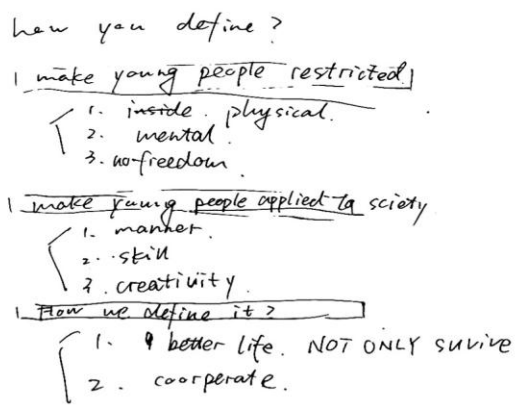
Topic B

Competition is a remnant of a primitive past, but it does not come to use through the genes. It is passed onto us through training in our society, training that starts early. I do not believe that rivalry among children of the same family is instinctual; I believe that it is endangered by parents who were themselves victims of victims. As a result, many children are pressured into Little League or similar activities and organizations, which really satisfy their parents' craving for competitive success. [adapted from Theodore Isaac Rubin, "Reconciliations"]

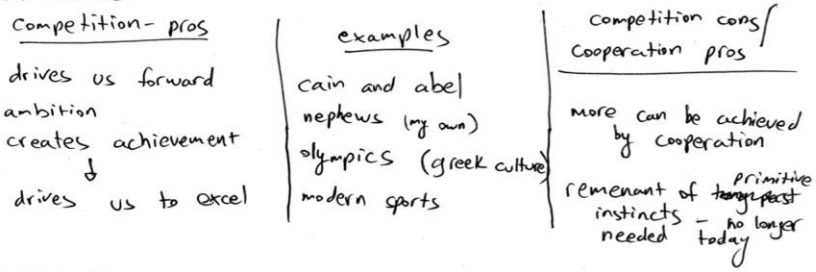
Assignment: What is your view on the idea that competition is a negative value imposed on children by their parents? In your essay, support your position by discussing an example (or examples) from literature, the arts, science and technology, politics, sports, current events, or your experience or observation.

Appendix B

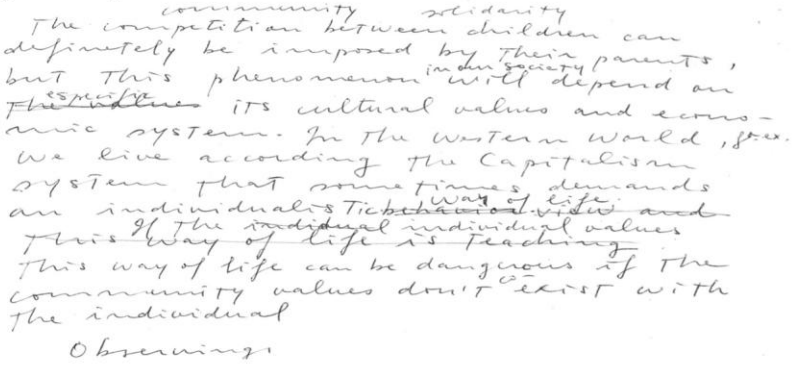
(a) Outlining



(b) Listing



(c) Drafting



Appendix C

Descriptive Statistics of All Linguistic and Cohesion Measures

Measure	Mean	SD	Minimum	Maximum
Mean length of sentence (MLS)	18.75	3.84	10.95	47.46
Mean length of clause (MLC)	9.70	1.58	6.33	18.64
Clauses per T-unit (C/T)	1.77	0.31	1.10	2.88
Coordinate phrases per clause (CP/C)	0.24	0.12	0.02	0.80
Complex nominals per clause (CN/C)	1.16	0.31	0.42	3.14
HD-D (D)	35.31	0.94	31.83	37.76
Measure of textual lexical diversity (MTLD)	87.45	19.64	33.39	169.30
Corrected TTR (CTTR)	6.63	0.73	4.12	8.87
Lexical sophistication 2 (LS1)	0.22	0.06	0.10	0.40
Lexical sophistication 2(LS2)	0.21	0.05	0.10	0.38
Corrected verb sophistication (CVS)	0.64	0.31	0.09	1.91
Word2vec sentence similarity	0.86	0.03	0.79	0.92
Word2vec paragraph similarity	0.89	0.07	0.00	0.97
LSA sentence similarity	0.31	0.09	0.09	0.70
LSA paragraph similarity	0.51	0.16	0.00	0.95