

## **Form-Focused Instruction for the English Article: A Meta-Analysis**

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### **Abstract**

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Factors, such as treatment complexity and duration, language proficiency, and educational context (EFL vs. ESL), can significantly influence language performance in experimental studies. The purpose of the present meta-analysis is to investigate the degree to which these causal factors influence linguistic improvement in studies of the English article. Nineteen experimental studies of the English article were chosen for analysis. After data were collected, the effect sizes of individual causal factors were compared using Spearman rank-order correlation. Next, the combined influence of the causal factors was calculated by performing a multiple regression. The results suggest that each hypothesized influence contributes to the effect size, and together, they account for nearly one fifth of the variance of effect sizes within individual studies. Due to the significance of the results, it appears essential that the determinants examined in this study be considered when assessing the effectiveness of grammar-focused instructional techniques. In the

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future, more multivariate, holistic studies are needed to understand how systematic differentiation of these multiple causes can improve the acquisition process.

Keywords: Meta-analysis, English Article, Treatment Complexity, Treatment Duration, Language Proficiency, EFL, ESL

주제어: 메타분석, 영어관사, 학습내용의 복잡성, 학습횟수, 언어능력, 외국어로서의영어, 제2언어로서의 영어

## I. Introduction

Second language researchers and educators have traditionally been polarized into two camps, one emphasizing the utilization of purely meaning-focused activities, and another supporting an explicit focus on grammatical accuracy. In the past, proponents of an explicit focus on accuracy advocated the use of “synthetic” syllabi that emphasized grammatical structures over the contexts in which these structures were used. The syllabi were used with the Grammar-Translation and the Audiolingual approaches, which promoted grammar and vocabulary learning through rote memorization and language drills. As stated by Long and Robinson (2004), this type of emphasis on grammar was often ineffective, because it utilized an antiquated notion that language is a process of habit formation. It treated language as an academic exercise that could be learned, rather than an internal cognitive process which is molded by external stimuli. As a result, second language learners educated through such methods often gained a conscious understanding of grammatical rules and vocabulary, but could not effectively communicate through either oral or written discourse.

In contrast to grammar-based methods of language pedagogy, techniques which focused on meaning, such as the Natural Approach or Language Immersion, provided authentic input and contexts that promoted communication. Advocates of this teaching style asserted that grammar instruction was unnecessary and ineffective, since learners acquired grammar through an internal cognitive process

(Krashen & Terrell, 1983). Theories such as the Natural Order Hypothesis and Processability Model, which each outlined seemingly invariant orders of grammatical acquisition, were used to bolster this claim (Dulay, Burt, & Krashen, 1982; Dyson, 2009; Makino, 1979; Pienemann, 1991, 2005; Simmons, 2001).

While acquisition orders appeared to be highly immutable and purely cognitive, more modern research suggests that the sequences are indeed variable and molded by external environmental factors such as input frequency and salience (Goldschneider & DeKeyser, 2005; Ellis, & Collins, 2009; Ellis, & Larsen-Freeman, 2009; Luk & Shirai, 2009). Clearly, there are some external, environmental factors that influence the acquisition process, suggesting that input and pedagogical reform should be used to enhance the grammatical accuracy. The need for such reform is apparent when considering the highly meaning-focused immersion programs implemented in Canada. Although learners within these programs were provided with large amounts of input and ample opportunities to communicate, they continued to make basic errors with morphology and syntax (Williams, 1995). Concerning this issue, Williams (1995) stated that, “in focusing exclusively on meaning and the overall success of communication, we have overlooked the issue of accuracy.” (p. 13). As implied by this statement, there is a distinct need for emphasis of grammatical accuracy within communicative lessons.

While debates over the importance of meaning or accuracy continue, this controversy is much less contentious than it used to be (Renandya, 2013). The importance of integrating form-focused instruction within communicative lessons is now well documented (Norris & Ortega, 2000; Spada & Tomita, 2010). Although research has been able to establish a need for explicit grammar instruction in a general sense, it has still failed to clearly outline how pedagogical interventions and treatments should be tailored to the unique characteristics of each grammatical feature. This is primarily because research has sought to establish all-purpose pedagogical frameworks for grammatical features, rather than differentiated approaches based upon distinctive morphological or syntactic characteristics.

It appears that differentiation of instruction for grammatical features has been largely hampered by insufficient analysis of individual morphosyntactic differences and their impact on the instructional process. Although the meta-analysis by Spada and Tomita (2010) did examine grammar-focused instructional differences based on the complexity of morphosyntactic features, calculations were overly simplistic (complex vs. simple feature designations) and were based upon a linguistic concept of transformations which has been largely discounted (Goldschneider & DeKeyser, 2005). Goldschneider and DeKeyser (2005) have recognized that determinations of grammatical difficulty are more accurately based upon multiple factors that include complexity of form, complexity of meaning, and complexity of form-meaning mapping (DeKeyser, 2005). Because these factors determine how and when a grammatical feature is acquired, it is essential that they be collectively utilized to ascertain the efficacy of grammar-focused instruction. It is also important that influences such as language proficiency and educational context (EFL vs. ESL context) be considered, since they may impact a learner's ability to understand and benefit from pedagogical emphasis of a target feature. Through holistically investigating multiple influences, educators may better understand what types of instructional techniques are most effective for each grammatical feature, and in what educational contexts these techniques should be used.

## **II. Literature Review**

### **1. Form-Focused Instruction**

As with studies of other grammatical features, Form-Focused Instructional (FFI) research of the English article has expanded our understanding of how acquisition may be enhanced (Bitchener, Young, & Cameron, 2005; Ellis, Sheen, Murakami, & Takashima, 2008; Jang, 2006; Master, 1997; Sheen, 2010).

Bitchener (2008), for example, found that both written and oral corrective feedback could significantly improve use of the article. Sheen (2010), likewise, found that metalinguistic explanations and direct feedback could enhance written use of the same target feature. In regards to reading and listening input, Wong (2001) discovered that simultaneous emphasis of the definite article and passage content reduced performance on the target feature, suggesting that a more focused approach to FFI was needed. Subsequent research has confirmed the accuracy of this assertion (Ellis, Sheen, Murakami, & Takashima, 2008; Sheen, Wright, and Moldawa, 2009).

## **2. The English Article**

In addition to studies exploring pedagogical reform of input and output, research has been conducted to determine how sociological aspects of explicit grammar instruction may be utilized to enhance learning of the English article. Muranoi (1996, 2000), for example, studied how interactive feedback, in the form of negative recasts and explicit grammar explanation, could help student leaders within task-based groups. The study revealed that explicit debriefing of the target grammar yielded the most significant effect. Nassaji and Swain (2010) also studied sociocultural factors of explicit grammar instruction. Using a Vygotskian scale ranging from explicit to implicit strategies of interaction, one learner was provided with assistance appropriate for their Zone of Proximal Development (ZPD), while another learner was provided with random interventions. Results revealed that the learner who received level-appropriate ZPD assistance utilized articles correctly 82.8% of the time, while their counterpart used them correctly only 40% of the time.

Although we have gained a more holistic understanding of FFI designed for the English article, the knowledge gained from individual studies cannot easily be compared or contrasted. This is due to methodological differences of treatments which influence results. In past studies of English articles, researchers used widely different treatments to examine grammar instruction. Some of the

treatments, such as those by Master (n.d., 1994), for example, used complex interventions that emphasized 4 types of lexical variants (*a*, *an*, *the*,  $\theta$ ) and 14 to 20 different categorical distinctions of English article (See Table 1).

**Table 1. Scope of Treatments Within Studies of the English Article**

Study	Bitchener (2008) Bitchener & Knoch (2008)	Muranoi (1996) Muranoi (2000)	Master (n.d. 1994)
Target Structure	First mention “a” and subsequent mention “the”	Indefinite article (first mention)	Definite and Indefinite Articles
Forms	<i>A, The</i>	<i>A, An</i>	<i>A, An, The, <math>\theta</math></i> (Zero Article)
Number of Semantic / Syntactic Categories	-Count Singular Noun (e.g., “A pencil”)  -Unique by prior utterance (e.g., “A man went into the store. The man said...”)	Count Singular Noun (e.g., “A pencil”)	-Classification (e.g., “a book is what you read with”) -Identification (e.g., “the milk on the table is yours”) -Count (e.g., “a book”) -Noncount (e.g., “dinner”) -First Mention (e.g., “a man”) -Subsequent Mention (e.g., “A man went into the store. The man said...”) -Descriptive adjectives (e.g., “a first step”) -Ranking adjectives (e.g., “the first step”) -Defining relative clause (e.g., “a car that goes 50 mph”) -Limiting relative clause (e.g., “the car that won the race”)

<p>Number of Semantic / Syntactic Categories</p>			<ul style="list-style-type: none"> <li>-Partitive “of” phrase (e.g., “a cup of coffee”) squirrel has a tail”)</li> <li>-Descriptive “of” phrase (e.g., “the temperature of the sun”)</li> <li>-Generic “the” (e.g., “the squirrel is becoming a pest”)</li> <li>-General characteristics (e.g., “a</li> <li>-New knowledge (e.g., “a catastrophe”)</li> <li>-Shared knowledge (e.g., “the moon”)</li> <li>-Proper nouns (e.g., “the Amazon River”)</li> <li>-Classified proper nouns (e.g., “a Mr. Jones is here to see you”)</li> <li>-Identified proper nouns (e.g., “the Mr. Jones you met last night”)</li> <li>Idiomatic phrases (e.g., “have a cow,” “rise to the occasion)</li> </ul>
<p>Combined Complexity (Variants + Categories)</p>	<p>4</p>	<p>3</p>	<p>24</p>

Other studies of corrective feedback, in contrast, only chose to explicitly emphasize two lexical variants (*a*, *the*) with two categorical distinctions (*a* for first mention and *the* for subsequent mention) (Bitchener, 2008; Bitchener & Knoch, 2008). Because widely different forms of treatment were placed under one umbrella term, “form-focused instruction,” disparities among these treatments were largely overlooked.

### **3. Research Questions**

Questions concerning both treatments (complexity and duration) and indirect influences of treatments (learner proficiency and educational context) were constructed to assess the impact of form-focused instruction on language proficiency. The following questions about experimental studies of the English article were posed:

1. To what extent is language performance affected by the complexity and duration of form-focused instruction?
2. To what extent is language performance affected by language proficiency of the participants?
3. To what extent is language performance affected by educational context (ESL vs. EFL)?
4. How do factors of treatment, language proficiency, and educational context combine to predict language proficiency within experimental studies?

While the first three questions were designed to analyze influences of individual variables, the final question was crafted to collectively examine the impact of all variables.

## **III. Method**

### **1. Data Collection**

The purpose of this meta-analysis was to examine the influence of treatment complexity, the number of treatments, language proficiency, and context (EFL vs. ESL) on language performance within experimental studies of the English article. To select studies for examination, university library databases and Google scholar were systematically explored using search strings which included "definite article" or "indefinite article" and additional search strings such as "focus on form",



“control group”, “processing instruction”, or “dictogloss”. References found within experimental studies of the English article or other meta-analyses (e.g., Kao, 2013) were also systematically searched and included when applicable. Following the investigation, a pool of over 40 studies of English article instruction was available for evaluation. Since not all of these studies included the necessary elements for study, they were assessed for inclusion using the following criteria:

1. Includes form-focused treatment of the English article
2. Includes information about treatment complexity and duration
3. Has a control group for calculation of effect size
4. Includes an assessment of language performance

Using the above criteria, 19 studies were deemed eligible for inclusion within the meta-analysis. These studies are denoted with an asterisk (\*) in the reference section of the paper.

## **1. Independent Variables**

After research was chosen for the meta-analysis, data for each independent variable was systematically collected from the selected studies and recorded within a database. Information about the following independent variables was recorded:

1. Treatment Complexity
2. Treatment Duration (Number of Sessions)
3. Learner Proficiency

Treatment complexity was determined by adding the number of lexical variants included within the emphasis (total of four possible variants *a*, *an*, *the*, *θ* [the zero article]) and the number syntactic and/or semantic categories. Studies by Bitchener (2008) and Bitchener & Knoch (2008), for example, emphasized two lexical variants (*a*, *the*) with two categorical distinctions (*a* for first mention and *the* for subsequent mention), meaning that there was a treatment complexity of 4 (2 lexical variants + two categorical distinctions). Additional information about the categorical distinctions within studies may be viewed in Table 1. In addition to

treatment complexity, treatment duration was recorded as the number of treatment sessions utilized within a study.

Learner proficiency was recorded on a scale from 1 to 9. Number 1, for example, represented Novice Beginner, 2 represented Novice Mid, and 3 represented Novice Upper. Research designations as intermediate low, for example, were recorded as 4 (Intermediate Mid). If only beginner, intermediate, or advanced levels of proficiency were designated, the Mid value was used. Designations of language proficiency within these studies were not based on one reliable instrument. However, it was thought that the rudimentary classifications may reveal patterns that could be further investigated within future research. Although insightful, the proficiency levels within these studies should be interpreted with caution.

Educational context was represented as a binary value. The value 1 represented an EFL context, while the value of 0 represented an ESL context.

## **2. Dependent Variable and Effect Size**

Scores on language performance tests within the selected studies served as the dependent variable for the meta-analysis. These tests were a mixture of instruments that assessed both explicit (conscious) and implicit (unconscious) knowledge. While separation of these two test types for evaluation was desirable, the ability to do this was precluded by many experimental studies, which used a combination of both types of knowledge to assess learner performance. It was thought that comprehensive evaluation of all instruments would provide insight that could sponsor further inquiry at a later time.

Language performance scores were operationally defined by calculating effect size. Before performing this calculation, test score information for each experimental group and control group was entered into SPSS Version 20. All groups included within an experimental design were included within the database. Information for calculating effect size, such as posttest averages and their standard deviations, were all recorded for the experimental and control groups. Following

data entry, effect size for posttest mean scores was calculated using the method employed by Spada and Tomita (2010, p. 307):

$$d = [M_1 - M_2] / [\text{SQRT}[(SD_1^2 + SD_2^2) / 2]]$$

If information about posttest scores was unavailable, and information about the percentage of improvement was available, effect size was determined using an arcsine transformation chart (Lipsey & Wilson, 2001, p. 204). No other effect size calculations were required for this study. After effect size was computed, a weighted effect size was then calculated. The following formula was used for this calculation (Spada & Tomita, 2010, p. 308):

$$d' = [1 - 3 / (4N - 9)] d$$

The utilization of weighted effect size helped to ensure that studies with a small number of participants did not unnecessarily bias results within the meta-analysis.

### **3. Comparing Independent Variables with Effect Size**

Statistical comparison of independent variables to the dependent variable (effect size) was performed in two steps. First, both unweighted and weighted effect sizes were compared to treatment complexity, treatment duration, learner proficiency and educational context using the Spearman's rank correlation. This calculation was performed to assess individual influences of each independent variable in accordance with research questions one through three. Second, treatment complexity, treatment duration, learner proficiency, and educational context were compared to the dependent variable, effect size, using the multiple regression formula. This computation was an attempt to measure the collective influence of all 4 independent variables in accordance with research question four.

## IV. Results and Discussion

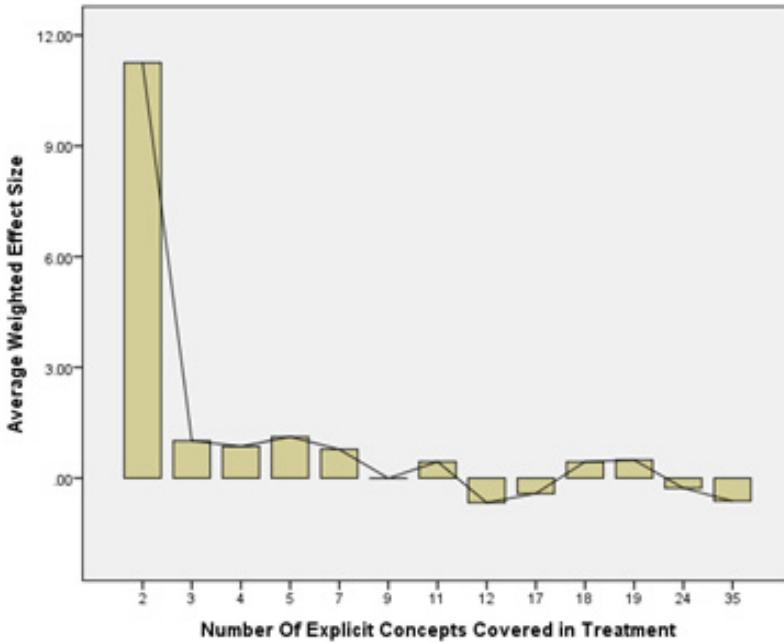
### 1. Treatment Complexity, Treatment Duration, and Effect Size

Correlations between treatments of experimental studies and effect sizes yielded interesting results. As can be seen in Table 2, both the number of concepts explicitly covered and duration of treatments were significantly related to effect size (See Table 2).

**Table 2. Spearman's Rank Correlations to Effect Size and Weighted Effect Size**

		Effect Size	Weighted Effect Size
Number Of Explicit Concepts Covered	Correlation Coefficient	-.516**	-.514**
	Sig. (2-tailed)	.000	.000
	N	73	73
Number Of Treatment Sessions	Correlation Coefficient	-.345**	-.343**
	Sig. (2-tailed)	.003	.003
	N	73	73

The number of concepts covered within treatments yielded the highest correlation. The relationship was highly significant for both unweighted ( $r_s = -.516$ ;  $p = .00$ ) and weighted effect sizes ( $r_s = -.514$ ;  $p = .00$ ). The high, negative correlation suggests that as the number of lexical variants and categories within a treatment increases, student performance on language tasks tends to decrease. Such an assertion is supported by more detailed investigation of studies included within this meta-analysis. Figure 1, for example, which graphically charts the effect sizes for each level of treatment, reveals a clear decline as complexity increases.



**Figure 1.** Comparison of average effect size to scope of treatment.

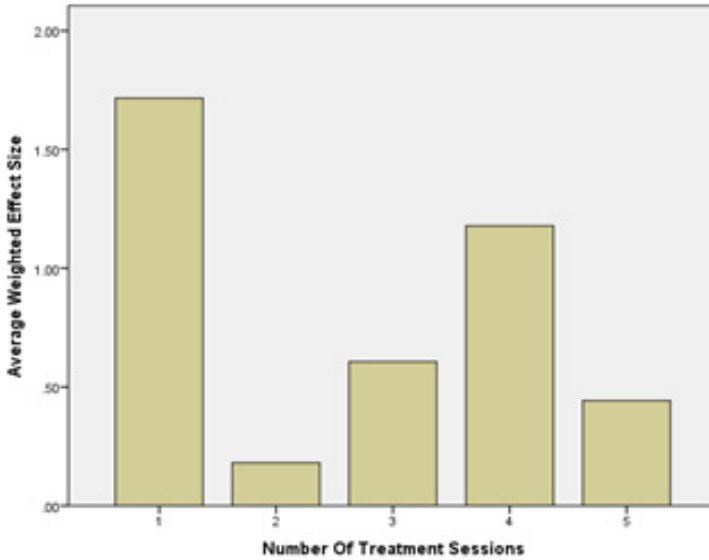
Like Figure 1, examination of individual studies revealed a relationship between higher treatment complexity and lower effect sizes. Studies by Master (n.d., 1994), for example, which had treatment complexities ranging from 11 to 35, had negative weighted effect sizes which averaged  $-0.246$ . Similarly, a study by Wong (2001), which integrated aspects of passage content into explicit emphasis of the definite article (treatment complexity of 12), had a negative weighted effect size of  $-0.6625$ .

Clearly, the number of concepts covered within a treatment appears to have some impact on overall language performance. Treatment complexity may also explain lower effect sizes found within studies of unfocused corrective feedback. A study by Sheen, Wright, and Moldawa (2009), for example, which used highly complex unfocused corrective feedback for multiple grammatical features (total treatment complexity of 9; 4 for the English article plus 5 for the other

grammatical features), had a negative effect size of  $-.01$ . In contrast, more simplistic corrective feedback focused on the English article (treatment complexity of 4), had a positive effect size of  $.98$ , nearly 1 standard deviation above the mean.

In contrast to studies with a high treatment complexity, those with a low treatment complexity revealed higher effect sizes. A study of computer-mediated corrective feedback by Sauro (2009) had the largest effect sizes, yielding 6.21 for the recast group and 16.30 for the metalinguistic feedback group. Unlike more complex treatments, the focus of this treatment was very narrow in scope, covering only one lexical variant of the article (the zero article) with abstract and noncount nouns (total complexity of 3). This study had the lowest instructional complexity of all treatments within the meta-analysis and the highest effect size. Other simplistic treatments, such as that by Bitchener and Knoch (2008), which covered only *a* for first mention and *the* for the second mention, tended to yield effect sizes of 1 or higher.

Like treatment complexity, a significant relationship between effect size and the number of treatment sessions was revealed through statistical analysis. Correlations to both the unweighted ( $r_s = -.345$ ) and weighted effect sizes ( $r_s = -.343$ ) were significant at the  $.05$  level ( $p = .003$ ). Superficially, the highly significant negative relationship between effect size and the number of treatments appears to suggest that a larger number of treatments will adversely affect learner performance. More detailed analysis of treatment sessions, however, suggests that this conclusion is inaccurate. Treatment complexity was not uniform throughout the number of treatment sessions. While effect size was very large for studies that utilized just one treatment, these studies tended to be more simplistic, covering 5 concepts or less (See Figure 2).



**Figure 2. Comparison of Average Effect Size to Number of Treatment Sessions**

Contrary to studies having only one treatment session, those having multiple sessions (from 2 to 5) included more complex instruction with a large number of concepts, ranging from 4 to 35. The only study which utilized 5 treatment sessions had a highly complicated explicit grammatical focus covering 18 concepts (Master, 1994). Taking into account the rise in complexity as the number of sessions increased, the decline in effect size is hardly surprising. Treatments with only a few concepts appear to be effective after one session, while those with more concepts require additional sessions to increase effect size. Further inquiry is needed to concretely determine how many treatments are required for each level of instructional difficulty. This inquiry will require the utilization of holistic designs that include treatments of varying complexity and duration. Such research will firmly establish how the number of concepts explicitly covered interacts with the number of treatment sessions to influence overall effectiveness of instruction.

## 2. Learner Proficiency Level and Effect Size

In regards to learner proficiency level, correlations to both the unweighted ( $r_s = -.274$ ;  $p = .030$ ) and weighted effect sizes ( $r_s = -.269$ ;  $p = .033$ ) were highly significant at the .05 probability level. Like the association between treatment sessions and effect size, the negative relationship with language ability may be an indirect reflection of treatment complexity. Among the studies selected for meta-analysis, more complicated instruction focusing on form tended to be given to higher proficiency learners. With the exception of only one experimental study, for example, groups with the largest treatment complexities, ranging from 11 to 35 concepts, had the highest proficiency levels (from Intermediate Mid to Advanced). The close connection between language proficiency and treatment difficulty serves to explain both the significance and negativity of the Spearman's rank correlation. The relationship between proficiency and effect size may thus reflect, albeit indirectly, a need for additional treatment sessions commensurate with the instructional complexity of a grammatical focus.

It should be mentioned that while insightful, any correlation of proficiency level to effect size must be interpreted with caution. First of all, there is not a normal distribution of proficiency levels. With the exception of only three studies (Bitchener & Knoch, 2010a; Master, 1994; Shintani & Ellis, 2013), all other research projects included learners at the intermediate level (intermediate high, mid, or low). Such a narrow scope severely limits understanding of the relationship between language proficiency and effect size of FFI treatments. A further complication is the lack of standardization of proficiency designations. They are based upon opinions of the researcher, rather than on assessments obtained from a standardized instrument. Essentially, the lack of standardized and reliable information about proficiency, along with the utilization of participants with highly similar ability levels, makes further investigation of instruction of the English article necessary. If future research utilizes participants of highly variable proficiency levels and consistently evaluates their progress through standardized instruments, educators may be able to understand when a particular grammar



treatment should be introduced.

### **3. EFL / ESL Context and Effect Size**

In contrast to proficiency level, comparison of effect size to ESL / EFL contexts did not reveal a significant difference. The Spearman's rank correlations for both unweighted ( $r_s = .044$ ;  $p = .713$ ) and weighted ( $r_s = .045$ ;  $p = .704$ ) effect sizes were very low, suggesting that context may not have a significant impact on English article instruction.

Although insignificant, mean effect sizes for EFL and ESL contexts seemed considerably different. Posttest scores within EFL contexts were higher, yielding an average weighted effect size of 1.678, while the average ESL context effect size was .659. The difference may indicate that there is some influence within EFL contexts, albeit insignificant, which makes either explicit or implicit grammar treatments more effective. If an influence does indeed exist, it may signify that learners in EFL contexts, lacking sufficient input to acquire a foreign language naturally, rely more heavily on explicit grammar reflection and metalinguistic strategies to learn a language. More research is needed to better understand if, and in what way, educational context influences grammar instruction.

### **4. Integrating Variables and Predicting Effect Size**

Results of the multiple regression formula suggest that independent variables (treatment complexity, treatment duration, proficiency level, and ESL/EFL context) collectively serve as one significant predictor of effect size. While the regression correlation was  $R = .436$ , the R Square value was  $R^2 = .19$ , indicating that nearly 20% of variance in effect size can be explained through concomitant consideration of the hypothesized causal factors.

While the multiple regression correlation is not high, the corresponding ANOVA value ( $F = 3.411$ ;  $p = .014$ ) does suggest that this value is significant, and could not occur by chance. In addition to this significance, low variance

inflation factors (VIF), all below 5, and high tolerance levels, all above .2, further suggest that there is no multicollinearity between the independent variables (Appendix A). Taken as a whole, statistical analysis appears to indicate that each of the independent variables has a distinct role in the prediction of overall language performance.

**Table 3. Multiple Regression**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.436	.190	.135	2.05551

While the value generated by the regression formula cannot predict effect sizes in their entirety, it is large enough to explain a fifth of the variability between studies. Clearly, there is a substantial influence exerted on language performance by treatment complexity, the number of treatments, language proficiency, and educational context. Although plainly evident within the current meta-analysis, past research has not clearly identified this relationship. The failure appears to be due to overemphasis of a scientific method that regulates “extraneous” experimental conditions through the maintenance of uniformity (e.g., same treatment complexity, same number of treatment sessions, participants at similar levels of proficiency, etc.). Despite being insightful, research conducted in this way can only answer if a particular pedagogical technique is effective under the unique circumstances of an individual study. Such a limited scope does not provide the information necessary for real-world contexts, which include a number of consistently changing variables; instead, it merely provides vague answers to simplistic questions such as:

1. Is form-focused instruction effective?
2. Are recasts effective?
3. Is implicit (or explicit) instruction more effective?

Rather than simply controlling for a few independent variables through making other experimental conditions the same, new research must focus on the methodic manipulation of both independent and environmental variables. Aspects of treatment complexity and duration, for example, should be systematically changed to identify just how useful a particular treatment is. Likewise, proficiency level should be systematically modified to determine when a particular type of grammar instruction has the optimal effect. Such systematic variation in experimental studies will help provide a more holistic perspective of form-focused instruction and its impact on the acquisition process. Moreover, it may serve to answer more in-depth questions such as:

1. To what degree is a particular pedagogical technique useful?
2. When should the pedagogical technique be introduced (e.g., at what proficiency level)?
3. Which grammatical feature benefits most from this pedagogical technique?

New research resolving questions such as these will provide more detailed guidance for curriculum design and instruction. Unlike past experimental studies examining only one independent variable in isolation, multivariate approaches may yield pragmatic guidelines for the highly variable real-world contexts in which they must be applied.

One major issue concerning systematic differentiation of multiple variables is that the more holistic research objectives required for such investigation cannot easily be fulfilled within just one study. Often, several separate studies must be conducted and subsequently compared to achieve research goals. In order for this to be plausible, larger cooperative efforts using standardized measures for variables such as treatment complexity, treatment duration, proficiency level, and educational context will be needed. Standardization in this way can allow for the controlled collection of data, methodical comparison of results, and development of new, more holistic perspectives. As results of experimental studies are compared and compiled into a more comprehensive framework, an empirically testable curriculum may be developed which allows educators to systematically “engineer” grammatical accuracy. In the future, more holistic study may also

yield algorithms for automated technologies that greatly enhance the acquisition process.

## V. Summary and Conclusions

The present study sought to investigate whether multivariate analysis of treatment complexity, treatment duration, proficiency level, and instructional context (EFL vs. ESL) could explain language performance within experimental studies of the English article. Spearman's rank correlations of treatment complexity revealed significant negative relationships to both unweighted and weighted effect sizes, suggesting that language performance was closely linked to the difficulty of grammar-focused instruction. As the lexical variation and semantic concepts of grammatical instruction increased, performance of the English article tended to decrease. While the results appear to suggest that very complex treatment is ineffective, it may actually indicate that more treatment sessions are needed. Additional research is required to identify the relationship between treatment complexity and treatment duration, so that the efficacy of form-focused instruction for the English article may be enhanced.

Although treatment sessions and language proficiency were both significantly correlated to effect size, these relationships were weaker than the link reported between treatment complexity and effect size. In actuality, the negative correlations for treatment sessions and language proficiency appeared to be indirect reflections of treatment complexity. More difficult treatments were generally given to higher proficiency learners through more extensive, time-consuming interventions. While ESL/EFL context was not significantly correlated to effect size, educational environment may still be a partial determinant of language performance. This view is supported by multiple regression analysis, which revealed that context was the most significant predictor of effect size (Appendix A).

**Table 4. Sample Emphasis for the English Article Based on Treatment Complexity and Proficiency**

Pro- ficiency Level	Semantic / Syntactic Concepts for Explicit Presentation(Top-down / Focus on Meaning)	Forms for Explicit Presentation (Bottom-up/ Focus on form)	Difficulty Level of Explicit Instruction	Duration in Hours
Beginner	“uniqueness”	the	$1 + 1 = 2$	1
	first mention / subsequent mention	a, the	$2 + 3 = 4$	2
Inter- mediate	abstract nouns / unique things in our situation / unique things in our neighborhood / unique things in our city / parts of a list	the	$4 + 1 = 6$	3
	“uniqueness”, first mention, subsequent mention, noncount nouns	a, an, the, $\theta$	$3 + 4 = 8$	4
Ad- vanced	unique things in our world / abstract nouns / noncount nouns / unique things in our society / unique situation / unique things in our neighborhood / unique things in our city / elements of a list	the, $\theta$	$6 + 1 = 10$	5
	generic things / unique things in our world / unique things in our society / unique situation / unique in our neighborhood / unique things in our city / abstract nouns / noncount nouns	a, an, the, $\theta$	$6 + 3 = 12$	6

On the whole, multiple regression analysis indicated that combined consideration of the independent variables could explain nearly 20% of the

variation in effect sizes of experimental studies. The significance of these results suggests that the aforementioned independent variables must be considered when ascertaining overall efficacy of experimental treatments. Furthermore, they should be systematically utilized within grammar curricula. The curriculum in Table 4 is just one example of how these multiple factors may be exploited to improve form-focused instruction of the English article (See Table 4).

Unlike most designs in modern ESL/EFL textbooks, the explicit concepts in Table 4 simultaneously consider aspects of treatment complexity, treatment duration, and language proficiency. As grammar-focused concepts grow in complexity, they are utilized with higher proficiency learners in a duration which is commensurate with difficulty level. Through using curricular frameworks like that in Table 4, researchers can both consider and analyze multivariate influences within their experimental designs, and educators can utilize the multiple variables to systematically and incrementally improve instruction.

While the conceptual framework in Table 4 is a step forward, more research is needed to confirm that the multiple variables are correctly utilized. In order to study multivariate relationships in a holistic way, several studies will need to be conducted and compared using standardized measures for treatments, proficiency levels, and educational contexts. Future studies must look beyond simplistic designs that analyze just one independent variable in isolation. Such research is far too limited to provide pragmatic solutions for highly complex real-world issues. Research projects must now begin to develop holistic, multi-stage designs which investigate not only numerous variables, but the systematic modification of these variables and their associated relationships. Such a methodological shift will help researchers and educators develop holistic curricular frameworks that can engineer desired results and significantly enhance the acquisition process.

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## Appendix A

**Table 1. ANOVA Results**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	57.645	4	14.411	3.411	.014 <sup>b</sup>
	Residual	245.057	58	4.225		
	Total	302.703	62			

a. Dependent Variable: Weighted Effect Size

b. Predictors: (Constant), EFL/ESL Context, Number Of Explicit Concepts Covered, Proficiency Level, Number Of Treatment Sessions

**Table 2. Collinearity Statistics**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics		
	B	Std. Error	Beta			Tolerance	VIF	
1	Constant	1.409	.999		1.411	.164		
	Number Of Explicit Concepts Covered	-.060	.047	-.180	-1.279	.206	.706	1.415
	Number Of Treatment Sessions	-.608	.353	-.256	-1.723	.090	.632	1.581
	Proficiency Level	.170	.227	.101	.749	.457	.772	1.295
	EFL or ESL	1.908	.742	.318	2.569	.013	.911	1.098

a. Dependent Variable: Weighted Effect Size

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