

Syntax Surgery Strategy for Enhancing Syntactic Parsing and Reading Comprehension Among Iraqi EFL Learners: An Applied Linguistics Perspective

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ABSTRACT:

There is a serious problem with the ability of Iraqi EFL university students to read and understand the texts, especially in the case of the meaning construction when syntactically complex structure is involved. From the applied linguistics perspective this study has attempted to explore the role of the Syntax Surgery Strategy in enhancing syntactic parsing and reading comprehension of Iraqi EFL university students. Quasi experimental pre-test and post-test control group design was adopted, 150 undergraduate students of the Department of English, Faculty of Education for Women, University of Kufa, was used. The students were equalized into the experimental (N = 75) and control (N = 75) group. The experimental group was systematically instructed using sentence segmentation, sentence structure analysis, sentence manipulation and sentence reconstruction (Syntax Surgery), while the conventional instruction was provided in the control group. These syntactic parsing and reading comprehension measures were used in pre- and post-testing to gather data. Within-group and between-group comparisons were made using independent samples t-test, paired samples t-test, and effect size measures. This study investigates if explicit syntactic manipulation enhances learners' processing of grammatical relationship and building textual meaning. The results are hoped to offer an empirical basis on the interface between syntactic processing and reading comprehension and to integrate syntax informed instruction in the Iraqi university EFL pedagogy.

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1. Introduction

Reading comprehension is one of the key aspects of academic literacy and integral to successful English as a Foreign Language learning. At the university level, beyond the capacity to retrieve information from written texts learners are expected to be able to interpret more complex linguistic structures, establish relations between propositions, make inferences and create coherent representations of meanings. These requirements are especially relevant for Iraqi EFL university learners as they are commonly faced with English in formal settings, and reading for academic purposes is a crucial source of ongoing language input and language development (Vettori & Bigozzi, 2025; Siregar, 2025). Yet, many Iraqi EFL learners still have problems in understanding texts with sentences of complex structure although they have extensive exposure to them during their formal education. These challenges point to the fact that lexical knowledge alone is not enough to account for successful reading and that there is a need to pay attention to the processes by which the meaning of text is derived, namely, the syntactic processes.

In the field of applied linguistics, reading comprehension has been perceived as a multidimensional process of which the interplay of the following components is involved: lexical knowledge, syntactic knowledge, semantic knowledge, cognitive knowledge, and discourse knowledge. While vocabulary knowledge offers an invaluable starting point in accessing the lexicon, knowing the meaning of a word doesn't necessarily help the learner to know how the word is related to the other words in a sentence. Readers need to identify the grammatical functions, make connections between phrases and clauses, and connect these connections to meaningful propositional representations. If these processes are not efficient, learners might be able to understand most of the words in a sentence, but not be able to interpret the meaning of the sentence. Syntactic processing is thus a vital step in the interaction between linguistic structure and text comprehension (Alshehri, 2021; Almarshedi, 2022).

The Construction Integration Model gives additional theoretical backing for the study of syntactic parsing in reading comprehension. Kintsch (1998) suggests that comprehension would consist of the construction of propositional representations and their input to a coherent mental representation of discourse. It is therefore important to have sentence level structural analysis in which incorrect interpretation of syntactic relationships may lead to incorrect propositions being generated from a sentence and finally to problems in discourse level integration. MacKay et al. (2021) also highlight the need of attention to sentence level information for successful reading comprehension. Thus, the parsing of complex structures could have implications beyond the sentence level, and it could mean that the reader's construction of coherence for the text as a whole might get disrupted.

In this background it is possible to evaluate that the pedagogical method of Syntax Surgery is a potentially productive approach to the Syntactic Processing development. The approach is based on the systematic analysis of a complex sentence by breaking it down into its grammatical components, exploring their interconnections, and then synthesising them back into the sentence to create a coherent and meaningful whole (Khalaf, 2025). Instead of grammar as a list of discrete rules, Syntax Surgery focuses the student's attention on grammatical structure in meaningful linguistic contexts. By segmentation, analysis, manipulation, and reconstruction, learners are invited to see how structural configurations make meaning and how different syntactic relationships can affect meaning.

The study is based on the hypothesis then that, Iraqi EFL university students who are instructed by the method of syntax surgery will show statistically significant improvement in syntactic parsing and reading comprehension than those who are taught by conventional method. The study aims at making an empirical investigation of these two outcomes in order to help develop a more integrated knowledge of the way in which the explicit instruction of sentence structure can aid higher level comprehension process and to

bring pedagogical evidence to bear in the teaching of EFL in universities.

2. Literature Review

2.1. Reading Comprehension in EFL

Contexts

Reading comprehension is a complex linguistic and cognitive process which involves coordinating the processes of lexical recognition, syntactic processing, semantic interpretation, inferential reasoning and discourse integration. This process may be especially challenging for EFL learners, as lexical and grammatical processing may not be as automatic as in the case of proficient first language readers. This means that students might put a lot of resources into word recognition and sentence comprehension, which means they have less resources to draw on to build a coherent picture of what the text means (Alshehri, 2021; Almarshedi, 2022).

This is of special importance to the EFL education in Iraq. Reading explanation and translation task is a strategy that has been widely used to facilitate reading comprehension (Razaq & Ahmed, 2024). While these exercises can help with the lexical understanding, they cannot necessarily provide the learner with independent strategy to deal with unfamiliar syntactic structure. These restrictions can be even more problematic at university level because students are expected to understand academic texts where the language is more sophisticated. Instruction in reading should, therefore, be so adjusted that it not only covers the meaning of the individual words but also the way in which the words are grouped into meaningful propositions by means of grammatical relations.

2.2. Syntactic Awareness and Semantic Processing

Syntactic awareness is the conscious knowledge that learners have about the recognition, analysis and manipulation of the grammatical structure. In the field of reading, many researchers found that there is a significant association between the syntactic awareness and reading comprehension and that sensitivity to sentence structure plays a significant role in successful textual interpretation

(Guo, 2008). However, syntactic parsing is more specifically concerned with processing that occurs when readers determine how words, phrases, and clauses are structurally related during comprehension.

Syntactic parsing is also important from an applied linguistics point of view because it serves as one vital link between grammatical competence and language processing. In order to build up an accurate interpretation, the reader has to recognize boundaries of constituents, bring in grammatical functions, establish dependency and determine the relationship between clauses. Students can misinterpret a sentence even if they know the words used in it, due to the challenge that they pose in these operations. Therefore, syntactic knowledge should not only be viewed as knowledge of rules, but also as a processing resource which plays a direct role in the construction of meaning.

2.3. Grammar Instruction and Reading Comprehension

Language comprehension-grammar instruction has been an area of special attention in second language pedagogy. Traditional grammar teaching often focuses on grammar rules, terminology and controlled exercises. While this instruction can enhance declarative grammars, it is still possible for learners to experience difficulties in applying this knowledge to authentic or challenging texts of classroom or academic nature.

Thus, Syntax Surgery can be considered as an interface between explicit grammar teaching and meaning oriented reading. This is not a strategy of asking learners to recognize grammatical categories, but rather involves them in an investigation of how structural relationships assist in the interpretation. This involvement can enhance syntactic knowledge and build efficient parsing strategies that can in turn serve the task of comprehending text.

2.4. Constructivist & Sociocultural Perspectives

The pedagogical approach of Syntax Surgery may also be viewed as a constructivist and a

sociocultural approach. Constructivist theory considers learning to be an active process, and knowledge to be built up by exploring, analyzing, problem solving and reflecting. In Syntax Surgery, students manipulate the language, rather than just being acted upon by grammatical explanations. They recognize structural elements and analyze interrelationships between constituents, can reconstruct sentences and make judgments about structural variations.

Sentence reconstruction in groups can also be used to get the learners to talk about the reasons for the structure, the different interpretations, and agree on the grammatical relationships. The source article also describes the application of the scaffolded procedure for identifying sentence boundaries, recognizing clauses, and analyzing the grammatical relationships, and reconstructing the sentence through a process that the author calls "Syntax Surgery." These procedures may help develop learners' metalinguistic understandings of the structure of texts as well as grammatical competence.

2.5. Syntax Surgery as in Applied Linguistics Classroom Intervention

From an applied linguistics perspective Syntax Surgery is more than just a grammar technique for the classroom. It is a systemic instructional intervention that links knowledge of language to the cognitive mechanisms for sentence comprehension. It has a core process of segmentation, structural analysis, manipulation and reconstruction which promotes learners' ability to convert their abstract grammatical knowledge into strategies for processing written language.

The aim of the present study to investigate the relation between syntactic parsing and reading comprehension as distinctive outcomes among the Iraqi EFL university students. The methodology of this approach allows to examine the question whether the learners' syntactic processing is improved by the Syntax Surgery and whether the improvement of syntactic processing is related to the improvement of reading comprehension. The study aims to make a

contribution to the interface between grammar instruction, sentence processing, and second language reading in Applied Linguistics by extending this strategy to the university level EFL education, and by explicitly discussing syntactic parsing.

3. Methodology

1. Research Design

The quasi-experimental pretest and posttest control group research design was used in the present study to find the effect of the Syntax Surgery Strategy in improving the syntactic parsing and reading comprehension of Iraqi EFL University Students. This design was found to be suitable because it enables the impact of an instructional intervention to be explored in an authentic educational environment where total randomization may not be possible (Tavakoly et al., 2018).

In this study, 150 students of the Department of English at the Faculty of Education for Women/ University of Kufa were included. Two groups of equal numbers of participants were created. There were two groups of students, the experimental group who were taught by the way of Syntax Surgery Strategy and the control group who were taught by conventional method. The students of the experimental group were 75 students and the control group were 75 students. Pre-tests for syntactic parsing and reading comprehension were administered to both groups prior to the intervention to determine the starting level of performance and to ensure that the groups were comparable at the start of the intervention.

The independent variable was the Syntax Surgery Strategy, and syntactic parsing and reading comprehension were the two dependent variables. After the instructional intervention, both groups took a similar post-test. The resulting scores were statistically analyzed and compared to see if the exposure to Syntax Surgery caused a significant improvement in syntactic parsing and/or in reading comprehension in comparison to the conventional instruction.

Table 1: Experimental Design of the Study

Group	N	Independent Variable	Dependent Variable
Experimental	75	Syntax Surgery Strategy	Reading Comprehension
Control	75	Traditional Instruction	Reading Comprehension
Total	150		

3.2. Population

The participants in the current study included undergraduate students of English language in the Faculty of Education for Women, University of Kufa, as well as students of the Iraqi EFL undergraduate program in the academic year 422-431. The choice of this population was made since university EFL students are exposed regularly to texts that are linguistically demanding and demand effective syntactic processing and reading comprehension. The university environment also presents a suitable platform for a pedagogically examination of the effectiveness of the 'Syntax Surgery Strategy' from an applied linguists' perspective.

3.3. Sample

The sample was 150 EFL University students from the Department of English, Faculty of Education for Women, University of Kufa. The number of participants was split evenly between 2 groups. In the experimental group there were

75 students and in the control group there were 75 students. Instruction in the experimental group was provided via the Syntax Surgery Strategy while the control group received conventional instruction.

The instructional intervention lasted for eight weeks for the second semester of the 422-431 academic year. Both groups were taught under similar classroom conditions to provide consistency in the conditions of instruction and to reduce teacher related variation. Before the intervention, both groups had pretests on syntactic parsing and reading comprehension to determine the starting point of their performance and to ensure baseline equivalence. To determine if there are significant pre-test score differences between the two groups before implementing treatment, the pre-test scores were statistically analyzed. After the intervention, posttests were done to examine the effects on both dependent variables.

Table 2. Distribution of the Study Sample

Group	Section	Number of Students	Percentage
Experimental	A	75	50%
Control	B	75	50%
Total		150	100%

3.4. Equivalence of the Groups

Both the experimental and control groups were matched prior to the teaching to minimize the effect of other variables on the findings of the study. Relevant variables such as age and prior academic performance of the two groups were compared. A special emphasis was also laid on

their performance on the first two tasks, namely, syntactic parsing and reading comprehension, that were the major dependent variables of the study. Independent sample t-tests of pretest scores revealed that there was no preexisting difference between the two groups. Thus, the groups were deemed to be comparable enough to assess the impact of the Syntax Surgery Strategy.

3.5. Test Application

The procedure of the experiment was divided into 3 stages which were pretest, instructional treatment and posttest.

a. Pre-test

Both the experimental and the control groups were given pre-tests of syntactic parsing and reading comprehension prior to the instruction. The syntactic parsing test assessed the students' segmentation of sentence constituents, identification of clause boundaries, identification of grammatical relationships and interpretation of complex syntactic structures. Task for reading comprehension consisted of academic reading texts, multiple choice, true or false reading items and short answer reading items which tested various levels of reading comprehension.

The pre-tests had two main functions. Firstly, they set the baseline of the participants' performance with respect to the two dependent variables. Second, they offered statistical data on the initial comparability of the experimental and control groups prior to treatment with instruction.

b. Instructional Treatment

Following the pre-test, the experimental group was taught by the syntax surgery strategy and the control group was taught by the traditional or conventional strategy. The intervention consisted of 8 weeks of two sessions weekly, each for about 40 minutes.

Students were given syntactically complex sentences found in reading texts and asked to deconstruct, analyze, manipulate and reconstruct the sentences as a systematic process to implement Syntax Surgery (SS). There were five phases in the instructional procedure:

Sentence Identification: Student circles the syntactically complex sentences and/or potentially problematic sentences in the text of the reading.

Sentence Segmentation: All the chosen sentences were segmented into meaningful grammatical constituents: phrases and clauses were segmented, of course, in order to make the

internal organization of the sentences more transparent.

Syntactic Analysis and Reconstruction: The students could identify the grammatical function as well as the syntactic relation of the constituents and then they could reconstruct the segmented constituents to a grammatically coherent and semantically meaningful sentence.

Structural Explanation: The teacher led students in their analysis of syntactic dependency, the relationship and structure and how it contributes to the meaning of the sentence.

Transfer and Practice: Students looked at more sentences with the same kind of syntactic structures and applied the same procedures either in groups or on their own.

C. Post-test

Post-tests of syntactic parsing and reading comprehension were performed on both groups at the end of the 8-week intervention. The post-tests were designed to have the same content coverage, structure, difficulty and scoring procedures as the pretests. This score was then statistically analyzed to evaluate the changes within the groups as well as between the experimental and control groups.

The result of the pre-test and post-test performance provided empirical data to see whether the use of the syntax surgery technique was successful in increasing students' syntactic parsing and reading comprehension or not compared to the use of conventional teaching. This method also enabled the study to examine whether there was a parallel improvement in the understanding of written English that paralleled the improvement in structural processing.

3. Results

Pre-test and Post-test scores were statistically analyzed to test the research hypothesis. The purpose of the analysis was to go on comparing the scores of the experimental and control groups and to assess if the scores of the experimental group using the Syntax Surgery Strategy were significantly better with regards to syntactic parsing and reading comprehension.

4.1. Comparison of post-test scores of the Experimental and Control Group

After the instructional intervention the experimental group mean score was 38.64 (SD 12.18) while the control group mean score was 25.27 (SD 10.46). The mean scores difference shows that the students instructed using the Syntax Surgery Strategy have a better performance.

To see if the difference was statistically significant an independent samples t-test was used. The t-value was 7.22 with 148 df and the difference

between the experimental and control groups was statistically significant at $p < .001$. The size of the difference was also large, estimated Cohen's $d = 1.18$, considered large.

Based on this, the null hypothesis was rejected. Results showed that the scores of the experimental group were significantly higher than the scores of the control group after the instructional intervention which showed that the Syntax Surgery Strategy was effective in improving students' syntactic parsing and reading comprehension.

Table 3. T-test Statistics of Students' Post-test Scores

Group	N	Mean	SD	DF	t-value	Significance level
Experimental	75	38.64	12.18	148	7.22	$P < .001$
Control	75	25.27	10.46			
Total	150					

The results of the above demonstrate that the students in the experimental group gained an advantage as the instruction using the Syntax Surgery Strategy positively affected students' syntactic parsing and reading comprehension.

4.2. Comparison of Pre-test and Post-test Scores of the Control Group

A paired samples t test was employed to compare the pretest and posttest scores of the control group and to see if there was a statistically significant difference in the students' scores as a result of the conventional instruction. The pre-test mean score for the control group was 24.62 (SD = 10.31), and the post-test mean score was slightly higher, 25.27 (SD = 10.46).

The t-value for the paired samples t-test was 1.42 with 74 degrees of freedom. The significance value was $p = .160$, which is higher than the conventional value of .05. Therefore, there was no significant difference between the pretest and posttest scores.

These results suggest that with conventional instruction, there was little improvement in the control group. A small improvement in mean performance was found, but this was not significant enough to conclude that there was an improvement in syntactic parsing or reading comprehension.

Table 4. T-test Statistics of Pre-test and Post-test Scores for the Control Group

Group	N	Mean	SD	DF	t-value	Significance level
Experimental	75	24.62	10.31	74	1.42	$P = .160$
Control	75	25.27	10.46			

The results above show that there is only a minimal increase of the control group in syntactic

parsing and reading comprehension which implies that traditional teaching method resulted

in minimal change both for syntactic parsing and reading comprehension.

4.3. Comparison of Pre-test and Post-test Scores of the Experimental Group

The pre-test and post-test scores for the experimental group were compared by using a paired samples t-test to see the effect of the Syntax Surgery Strategy. The pre-test mean score for the experimental group was 24.31 and the post-test mean score was much higher at 38.64, with a standard deviation of 10.84 and 12.18 respectively.

Table 5. T-test Statistics of Pre-test and Post-test Scores for the Experimental Group

Group	N	Mean	SD	DF	t-value	Significance level
Experimental	75	24.31	10.84	74	10.67	P < .001
Control	75	38.64	12.18			

The significant difference between the experimental group suggests that the explicit training of syntax structure with the help of the Surgery Strategy of syntax has played a significant role in training students to develop syntax level parsing ability and improve reading comprehension.

4. Discussion

The findings of the present study confirmed the results of the current study showing that structured syntactic manipulation is an effective technique for improving the syntactic parsing in reading comprehension of Iraqi EFL university students. There was no significant difference between the experimental and control groups prior to the intervention, suggesting that they started off on a similar level. The post-test results, however, showed that the experimental group scores did show a statistically significant increase which suggested that the increase was due to the use of the Syntax Surgery Strategy.

These findings are in line with Kintsch's (1998) Construction Integration Model, which emphasizes sentence level processing in the development of the coherent meaning of a text.

The statistical analysis resulted in a t-value of 10.67, a difference which was statistically significant at $p < .001$ and 74 degrees of freedom. The significant mean difference between the pre-test and post-test scores suggest that the experimental group had a great deal of improvement after the instructional intervention.

Here the results point to a statistically significant improvement in the syntactic parsing and reading comprehension of the experimental group as a result of the Syntax Surgery Strategy. The findings thus suggest that systematic syntactic analysis and reconstruction is effective to enhance the students' performance.

The students were explicitly segmented, analysed and reconstructed complex sentences, which facilitated their attention to the syntactic relationship and constructing stronger propositional representations. With improved sentence level parsing, information was then incorporated into the overall meaning of the text.

The results also might be related to Sweller's (2011) Cognitive Load Theory. The participants' ability to process more than one syntactic relationship simultaneously may be due to the fact that the sentences were segmented into smaller manageable units of structures. This may have enabled students to be more efficient in memorizing while reading and more focused on the relationship between the grammatical structure and the meaning.

Furthermore, the findings are in line with Ellis's (2001) perspective of form-focused instruction that focusing on language form in meaningful contexts can facilitate language learning. Syntax Surgery is NOT a way to read in which syntax is a set of isolated rules. The significant enhancement of the experimental group further highlights the significance of syntactic awareness in reading performance (Teng & Cui, 2025).

Overall results suggest that the Syntax Surgery Strategy allows for not only successful sentence level syntactic processing, but for successful reading comprehension as well. The strategy, therefore, is pedagogically pertinent in the context of Iraqi EFL University learners in the field of Applied Linguistics because it offers a realistic link between explicit instruction in syntax and interpretation of texts.

5. Conclusion

In the present study, the researchers examined the effectiveness of the Syntax Surgery Strategy in improving syntactic parsing and reading comprehension of 150 Iraqi EFL university students. Results showed that systematic sentence segmentation, syntactic analysis, and structural reconstruction played significant roles in the achievement of students getting Systematic Sentence Segmentation and Syntactic Analysis for Structural Reconstruction (Syntax Surgery) when compared with students getting conventional instruction. The findings especially stress the significance of sentence level parsing as a part of effective EFL reading comprehension.

The results also show that the use of Syntax Surgery offers students a systematic way of analysing complex sentences, identifying relationships between them and linking syntax to the meaning of the text. Students actively analysed and reconstructed sentences, increasing their awareness of the interaction of language components in the creation of meaning. The approach also promoted “active learning” and “collaborative learning” where the students were encouraged to discuss the structural relationship and gain more independence in sentence analysis.

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The results of the study led to the following conclusions:

Better Syntactic Parsing and Reading Comprehension:

The students' ability to analyse complex sentence structures and to comprehend written texts was improved significantly by the use of 'Syntax Surgery'. The strategy helped to identify the syntactic relations and to create meaning in a better way.

Promotion of Active and Collaborative Learning:

The method invited the students to be active in the sentence analysis and sentence reconstruction. Discussions of syntactic patterns, comparing interpretations and increasing independence from direct teacher guidance were provided in collaborative activities.

Pedagogical Value of the Use of Syntax Surgery:

as a pedagogical approach to integrate Explicit syntactic analysis and Reading comprehension has been proved to be effective for Iraqi University EFL learners. Its systematic procedures helped learners tackle complex sentences systematically and further promoted the linkage between grammar and text comprehension.

Finally, the use of Syntax Surgery Strategy is an interactive and systematic approach to teaching that has the potential to improve EFL University students' sentence level syntactic processing and their reading comprehension in the Iraqi context. The results, from an applied linguistics point of view, suggest the importance of incorporating explicit syntactic analysis into the university EFL reading classroom and the pedagogic significance of linking grammatical structures with meaning.

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