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Does applying inductive methods based on system thinking improve EFL grammar learning?

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Abstract

Purpose – This study examined the effect of incorporating an inductive method based on system thinking to enhance grammar learning in the English language at a secondary school in Saudi Arabia.
Design/methodology/approach – The researcher developed pre- and post-grammar tests for this study. Two EFL teachers participated; one taught the experimental group using inductive methods based on system thinking, while the other taught the control group using the traditional deductive approach to grammar instruction. Around 52 students participated in both the experimental group (26) and the control group (26). At the beginning of the term, all students completed pre-tests, and after eight weeks they completed the post-tests.
Findings – The results demonstrated significant differences between the experimental and control groups. The findings revealed that using inductive methods based on system thinking was highly effective in improving students' grammar performance.
Research limitations/implications – This study could benefit EFL teachers, encouraging them to use inductive materials based on system thinking to create a more meaningful, interactive and engaging learning environment.
Originality/value – This study fills a gap in the EFL literature since it examines the impact of an inductive approach based on system thinking in grammar learning. System thinking activities encourage deep reflection, helping learners deduce grammatical rules. This study could benefit EFL teachers, encouraging them to use inductive materials based on system thinking to create a more meaningful, interactive and engaging learning environment.

Keywords System thinking, EFL, Inductive methods, Grammar learning
Paper type Research paper

1. Introduction

Grammar instruction is regarded as critical for EFL students to improve their language skills and understanding (Al-khresheh and Orak, 2021). According to Alnoori and Alnoori (2019), some EFL teachers find it difficult to teach grammar because it requires creativity and the development of engaging teaching methods. Therefore, employing effective teaching methods while teaching grammar helps students apply grammatical linguistic forms (Ellis, 2006; Rao, 2019). Teachers must thus implement efficient strategies to help students understand grammar principles through indirect materials (Ellis, 2006; Christison *et al.*, 2015).

An example of using effective methods is when teachers utilize different materials such as reading texts, presenting dialogues, and playing games. Through these materials, students

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learn new grammar rules (Christison *et al*., 2015; Tursunovich, 2022; Hinkel, 2024). This is called inductive teaching, which is based on presenting examples that clarify and help learners understand the rules. By working through these examples, students learn grammatical rules (Christison *et al*., 2015; Indriyani, 2021; Hinkel, 2024). In the inductive method, the materials assist learners' system thinking, enabling them to relate, analyze, and build on what they already know, as well as create new knowledge (Gu and Lornklang, 2021).

However, EFL learning is not effective when teachers rely on traditional grammar teaching methods, which are insufficient for enabling learners to practice language concepts (Çiftci and Özcan, 2021). Learning grammar in EFL requires learners to engage in critical thinking, as they need to understand how the rules work in real-life contexts. Thus, EFL grammar learning is not merely based on knowledge reception but focuses more on knowledge production (Nassaji and Fotos, 2011; Christison *et al*., 2015; Sukying, 2020). Therefore, EFL learners need innovative methods for learning grammar, grounded in practice and training (Nassaji and Fotos, 2011). They must grasp the most basic concepts before progressing to a more advanced level that allows them to comprehend the broader principles (Al Bataineh *et al*., 2019).

In Saudi secondary schools, EFL is a compulsory course that learners must pass and apply in real-life situations. However, researchers (Fareh, 2010; Al-Hamlan and Baniabdelrahman, 2015; Al-Seghayer, 2015; Alhaysony and Alhaisoni, 2017) have reported that Saudi secondary learners exhibit a weak proficiency in EFL skills. Al-Seghayer (2015) suggested that poor communication skills could be the primary cause of learners' inadequate performance. Therefore, Saudi learners should employ communicative teaching methods that facilitate language use in communication.

Furthermore, numerous studies have indicated that Saudi learners face challenges in acquiring and applying English grammar, possibly due to the reliance on traditional methods for teaching grammar rules (Alrabai, 2016; Assalahi, 2013). Alrabai (2016) reported that one issue with EFL teaching in Saudi Arabia is the use of a teacher-centered approach, which negatively affects learners' progress. They also noted that the teaching methods used in Saudi EFL classes may not align with the Ministry of Education's goals for language learning. As a result, Alrabai (2016) recommends adopting appropriate teaching methods that help learners self-regulate and become independent, allowing them to actively participate in the learning process to understand and apply acquired knowledge.

Additionally, previous researchers have stated that EFL teaching in Saudi classrooms may not prioritize learner engagement (Rahman and Alhaisoni, 2013). Teaching EFL grammar in a passive environment may hinder learners from improving their language skills (Alrabai, 2016; Assalahi, 2013). Al-Hamlan and Baniabdelrahman (2015) claimed that Saudi learners expressed dissatisfaction with their proficiency, despite dedicating significant time to learning grammatical rules. This could indicate that Saudi EFL instruction focuses more on traditional grammar teaching methods.

In the international context of EFL literature, several studies have explored the effect of deductive and inductive approaches on grammar learning. Alnoori and Alnoori (2019) examined the impact of using activities to practice grammar learning. They applied a quasi-experimental design, and the number of learners was sixty in both experimental and control groups. The results showed that the experimental group outperformed the control group, suggesting that incorporating various activities can significantly improve EFL learners' grammar skills.

However, Lafta (2019) investigated and compared deductive and inductive methods, in teaching EFL grammar at the higher education level. The results showed that the deductive approach had a more positive impact than the inductive approach. On the contrary, Obeidat and Alomari (2020) found that the experimental group had higher scores than the control group when investigating the effect of inductive and deductive approaches on EFL learners' achievement in higher education.

Grammar learning requires an active environment where learners can construct knowledge, engage in the learning process, and ultimately acquire the desired understanding (Nassaji and Fotos, 2011; Hinkel, 2024). An inductive approach based on system thinking could help create an active learning environment in the EFL classroom. This method allows learners to relate, construct, and generate new knowledge through inductive instruction. Saudi EFL students, who need to apply their learning inside and outside the classroom, require effective teaching methods that enable them to self-regulate and develop ideas independently. Since inductive methods based on system thinking can help learners apply acquired knowledge outside the classroom, it is worth investigating their effectiveness in teaching EFL grammar.

EFL learners need techniques and strategies that help them overcome difficulties in learning the English language (Oktavia *et al.*, 2022). They must process information, moving from basic comprehension to more complex concepts. Strategies that help learners analyze and construct knowledge enable them to connect smaller pieces of information and develop a comprehensive understanding. Researchers (Alnoori and Alnoori, 2019; Obeidat and Alomari, 2020) have endorsed inductive methods for teaching grammar as effective in enhancing EFL learners' performance. However, no previous study has specifically examined the effectiveness of inductive methods based on system thinking to improve grammar learning. Using such methods could help students learn grammar in a more communicative and engaging manner.

This study is significant because it focuses on innovative teaching methods that enhance learners' ability to apply grammatical rules in communicative environments. The inductive strategy, based on system thinking, helps learners recognize and understand the complex aspects of their knowledge. Therefore, EFL teachers must consider learners' needs and employ innovative methods that provide ample opportunities to practice and learn the language. This study could benefit EFL teachers by offering a framework for teaching grammar inductively through system thinking. It could also inform policymakers about the need to include more innovative strategies for teaching grammar in EFL teacher training programs.

The current study could help in filling a gap in the EFL literature by investigating the effect of using an inductive approach based on system thinking to improve grammar learning. System thinking activities encourage deep reflection and help learners deduce grammatical rules. Both inductive and deductive approaches are commonly used for teaching grammar, but system thinking-based inductive methods represent an innovative and effective technique for teaching grammar. Therefore, this study aims to examine the effect considering the problems identified in the study.

The research question is:

RQ1. What is the effect of incorporating an inductive method based on system thinking in EFL grammar learning?

The research hypothesis is:

H1. Incorporating an inductive method based on system thinking enhances EFL grammar learning.

1.1 Inductive and deductive approaches

The inductive approach is considered an indirect method of teaching, while the deductive approach is a more direct method for teaching grammar rules. Deductive teaching could consider as traditional or direct method. However, the direct method has been found to be insufficient, as it does not allow more opportunities to think critically or relate knowledge to

one another (Benitez-Correa *et al*., 2019). Moreover, the deductive approach often results in passive learners who rely on the learning environment and EFL teachers to receive the required knowledge (Alzahrani, 2018). This approach is based on explaining rules, presenting examples, and then asking students to practice these rules. Unfortunately, students do not get the chance to practice the activity in real-life contexts using this method (Blašković, 2022).

On the other hand, the inductive approach allows learners to practice real-life examples. In this method, students discover rules through indirect materials while also engaging in real-life situations (Hoiruddin and Ulfa, 2020). The inductive approach encourages active thinking, as students must figure out grammar rules on their own. As a result, EFL teachers tend to focus more on strategies that promote independent learning and critical thinking throughout the process. However, the inductive approach takes more time than other methods because teachers must provide various indirect materials to introduce new grammatical rules (Christison *et al*., 2015; Sarwat *et al*., 2021; Indriyani, 2021; Hinkel, 2024).

As a result, EFL teachers are encouraged to use the inductive approach as it promotes active use of linguistic forms (Fathi and Feozollahi, 2023; Nur, 2020). In this method, students engage in more communication with both the teacher and their peers to discover rules and complete tasks. Therefore, deductive methods could reflect that teachers control the class, while inductive methods could reflect that learners engage more through learning. Several studies (Benitez-Correa *et al*., 2019; Lafta, 2019; Obeidat and Alomari, 2020) have experimented with both approaches and found that the inductive method offers numerous benefits. These include deep thinking, meaningful learning, and improved relationships between students and teachers, which can increase motivation and enjoyment in learning (Blakovi, 2022; Fathi and Feozollahi, 2023; Habibi, 2021).

In recent years, EFL students have shown a preference for learning through gradual, step-by-step processes, as they find organized instructions easier to follow (Dehqan and Hosseini Bay, 2019; Nhan and Yen, 2021). Mapping and infographics have emerged as effective visual learning tools that support meaningful learning (Alyahya, 2019). Maps help communicate new information by showing relationships between items, which enhances understanding. Infographics, including bar graphs, charts, tree diagrams, and mind maps, also enhance learners' system thinking skills (Manoïlov, 2023). These tools help students understand the relationships between topics, improving their overall knowledge acquisition and dynamic learning (Green *et al*., 2021). System thinking is considered a type of higher-order thinking that enables learners to comprehend subject matter logically (Elsawah *et al*., 2021). It helps organize the learning process, enabling students to engage in self-directed learning (Chumchuen, 2021).

1.2 System thinking

According to Jackson (2019), system thinking is defined as a group of elements and items that depend on one another to create meaning from a concept as a whole. It is essential in teaching grammar to help learners understand complex systems. The approach is especially important for teaching new grammar rules, as EFL learners need both theoretical understanding and practical application to use these rules in communication (Chien *et al*., 2020). System thinking enables students to learn in a systematic way, deepening their understanding of grammar rules (Grohs *et al*., 2018). This method allows students to move from easier to more difficult concepts, facilitating comprehension. Learning becomes more effective when students grasp the relationships between concepts, enabling them to build their knowledge (Álvarez, 2020). System thinking was also helpful for learners in associating different concepts and topics. Additionally, system thinking helps learners associate different concepts, fostering meaningful learning and reflective thinking (Chang, 2019).

Moreover, system thinking promotes comprehensive awareness, enabling learners to analyze similarities, differences, and connections between concepts (Molderez and Ceulemans, 2018). This method supports learners in structuring their learning process by first identifying the problem, finding solutions, making decisions, and solving problems (Grohs *et al.*, 2018). It highlights the interconnectedness of concepts, which is crucial for problem-solving (Grohs *et al.*, 2018; Nagarajan and Overton, 2019). System thinking involves synthesizing and connecting ideas, helping learners reach a deeper understanding through practical activities (York *et al.*, 2019; Orgill *et al.*, 2019).

Furthermore, system thinking positively influences creativity. Learners who are adept at using system thinking tend to be more creative in their learning (Chen *et al.*, 2022; Molderez and Ceulemans, 2018). The key characteristics of system thinking include the ability to organize concepts, analyze them into smaller parts, identify relationships, reconstruct knowledge, and understand the bigger picture without focusing too much on the smaller details (Khaled, 2022). These characteristics are reflected in system thinking materials, which help learners enhance their cognitive processes during learning.

2. Methodology

This research employed a quasi-experimental method in which pre- and post-tests were administered to the targeted sample. Before conducting the study in Saudi schools, the researcher obtained ethical approval from Umm Al-Qura University and the administration of education in Makkah City.

The researcher then contacted two EFL teachers at a selected school to secure their consent to participate in the study. This particular school was chosen for its convenient location, and both experimental and control groups were drawn from two classes within the same school to ensure that external factors remained consistent. This approach aimed to enhance the validity of the collected data.

After receiving approval from both teachers, the researcher arranged for their students to complete an online grammar pre-test at the beginning of the second term of the 2023/2024 academic year. The grammar pre-test was sent to the teachers, and all students in both groups completed and submitted it online. At the end of the term, a post-test was administered to measure the effect of using inductive versus deductive teaching methods. The tests were designed based on the students' second-grade secondary school course book.

There are two groups included in this study: an experimental group in one class and a control group in a other class. The number of students was 26 in the experimental group and 26 in the control group (total 52). The participants, aged 16 to 17, were studying English in public schools in Makkah City. For this study, the teacher in the experimental group used an inductive approach based on system thinking materials. All grammar activities were adapted to focus on enabling learners to apply system thinking by relating, analyzing, and creating. Meanwhile, the teacher in the control group used a more traditional method, blending both inductive and deductive approaches, but emphasizing deductive instruction, which is the usual method for teaching grammar in EFL settings.

During the study, the researcher maintained regular contact and made visits to the teacher of the experimental group. The researcher designed, prepared, and suggested materials to ensure that students spent sufficient time working on materials based on system thinking. After eight weeks, the researcher administered the post-test to all participating students in both classes. The results of the quasi-experiment were then statistically analyzed using SPSS to reach to the answer of the research question and make comparisons between participated groups.

3. Result and analysis

The data illustrated in Table 1 suggests that scores of the post test for students in the experimental group, ranging from 30 to 90, demonstrate a notable improvement in grammatical knowledge. The control group also showed improvement, though more modestly, with post-test scores ranging from 15 to 80. This indicates that, compared to traditional teaching techniques, the systematic integration of inductive materials based on system thinking leads to better comprehension and achievement of English grammar principles among EFL learners, resulting in more substantial learning gains.

Table 2 provides statistics comparing two tests applied in this study for students in the experimental and control groups. The experimental group showed a significant increase in mean post-test scores, rising from 43.85 to 61.35. This improvement is especially remarkable considering the relatively high standard deviation of the pre-test scores (23.635), which indicates a wide range of initial performance levels. However, the control group revealed a more modest increase, with the mean post-test score rising from 32.88 to 43.27. While this suggests some progress, it is less pronounced than in the experimental group. Additionally, the scores of the pre-test and post-test for the control group had smaller standard deviations, indicating less variability in performance. These findings suggest that the experimental applied inductive based on system thinking affects significantly on improving students' grammar skills compared to the control group.

Table 3 presents the paired samples test results, indicating significant differences between the pre-test and post-test scores for both groups. For Pair 1: the mean differences between both groups in the experimental group was −17.500, with a standard deviation of 15.890. This reflects a significant improvement from the pre-test to the post-test. The 95% confidence interval for the difference ranged from −23.918 to −11.082, confirming that the true mean difference falls within this range. The p-value of 0.000 indicates that this difference is statistically significant. Similarly, for Pair 2 the mean difference between both tests for the control group appeared to −10.385, with a standard deviation of 12.077, indicating a significant improvement as well. The 95% confidence interval for this difference ranged from −15.262 to −5.507, also confirming statistical significance with a p-value of 0.000. These results suggest that both groups experienced significant improvement in grammar skills, though the experimental group showed a larger mean difference, indicating that the intervention was more effective for them.

Group	Lowest score	Highest score
Experi pre-test	15	90
Experi post-test	30	90
Control pre-test	15	60
Control post-test	15	80

Source(s): Author's own work

Table 1. Pre-post test score

		Mean	*N*	Std. Deviation	Std. Error mean
Pair 1	Pre_test_grammer_experi_Group	43.85	26	23.635	4.635
	Post_test_Grammer_experi_Group	61.35	26	20.078	3.938
Pair 2	Pre_test_grammer_Control_Group	32.88	26	11.151	2.187
	Post_test_grammer_control_Group	43.27	26	15.488	3.037

Source(s): Author's own work

Table 2. Paired sample statistics

		Paired differences							
					95% confidence interval of the difference				
		Mean	Std. Deviation	Std. Error mean	Lower	Upper	t	df	Sig. (2-Tailed)
Pair 1	Pre_test_grammer_experi_Group - Post_test_Grammer_experi_Group	−17.500	15.890	3.116	−23.918	−11.082	−5.616	25	0.000
Pair 2	Pre_test_grammer_Control_Group - Post_test_grammer_control_Group	−10.385	12.077	2.368	−15.262	−5.507	−4.385	25	0.000

Table 3.
Paired sample test

Source(s): Author's own work

Table 4 presents the results of one-sample t-tests for the experimental group showing statistically significant differences from a test value of 0, confirming that the mean scores are significantly different from zero. For the pre-test scores, the t-value was 9.459 with 25 degrees of freedom, and the p-value was 0.000, indicating a highly significant difference. The difference in mean scores was 43.846, and the confidence interval was 95%, ranging from 34.30 to 53.39. This shows that the experimental group's pre-test scores significantly differed from zero, reflecting a baseline level of grammar skills before the intervention. Similarly, for the post-test scores, the t-value was 15.580 with 25 freedom's degree, and the p-value was 0.000, indicating a highly significant difference. The differences in the mean was 61.346, and the confidence interval was 95%, ranging from 53.24 to 69.46. These results suggest a significant improvement in grammar skills after the intervention. The findings from this test reinforce the results from the paired samples test, providing further evidence that the experimental intervention effectively improved grammar skills.

Table 5 presents the findings of one-sample t-tests for the control group's pre-test and post-test scores, also indicating statistically significant differences from a test value of 0. For the pre-test scores, the t-value was 15.037 with 25 degrees of freedom, and the p-value was 0.000, indicating a highly significant difference. The difference of mean score was 32.885, with a 95% confidence interval ranging from 28.38 to 37.39, confirming that the control group's pre-test scores significantly differed from zero, reflecting a baseline level of grammar skills. For the post-test scores, the t-value was 14.245 with 25 degrees of freedom, and the

	Test value = 0					
					95% confidence interval of the difference	
	t	df	Sig. (2-Tailed)	Mean difference	Lower	Upper
Pre_test_grammer_experi_Group	9.459	25	0.000	43.846	34.30	53.39
Post_test_Grammer_experi_Group	15.580	25	0.000	61.346	53.24	69.46

Table 4.
One-sample test experiment group

Source(s): Author's own work

p-value was 0.000, indicating a highly significant difference. The difference in the mean was 43.269, and the confidence interval was 95%, ranging from 37.01 to 49.53. This suggests that the control group's post-test scores also significantly differed from zero, confirming that the traditional deductive methods had a positive effect on grammar achievement. These results indicate that both tests for the control group significantly differed from zero, reflecting baseline skills and subsequent improvement. This further supports the moderate positive impact of the usual teaching methods applied to the control group.

4. Discussion

The result revealed a positive impact for EFL learners in both the experimental and control groups. However, the control group performed lower scores than the experimental group. These results align with previous studies, which suggest that traditional grammar teaching methods are less effective for EFL learners compared to more innovative approaches (Somani and Rizvi, 2018). However, Lafta (2019) found that deductive methods were more beneficial than inductive approaches when teaching EFL grammar in higher education. Conversely, Obeidat and Alomari (2020) concluded that learners in the experimental group received higher scores in the post-test than learners in the control group.

In this study, the teacher of the experimental group used inductive system thinking materials to teach grammar. The results showed that learners in this group improved their grammar proficiency, indicating that the activities and materials helped enhance their system thinking, which had a noticeable positive impact on their EFL grammar skills. This aligns with a study by Benitez-Correa *et al.* (2019), which demonstrated that learners taught with an inductive approach outperformed the control group in high school EFL classes. Similarly, Sato and Oyanedel (2019) found that using a system thinking model in intermediate schools led to favorable outcomes for the experimental group. These findings suggest that integrating an inductive approach with system thinking can have a significant effect on grammar learning.

Further studies support the positive impact of curriculum and extracurricular activities on developing both general and system thinking in learners. For example, Garay and Reyes (2019) observed these effects in Colombian learners. Additionally, Alnoori and Alnoori (2019) conducted a more specific study on the impact of activities aimed at enhancing grammar learning. They reported positive results for learners in the experimental group, indicating that using innovative activities can improve EFL learners' grammar. They recommended incorporating activities that foster an engaging learning environment to promote meaningful learning.

Based on the result of this study, Saudi learners scored higher in the experimental groups than learners in the control group after being taught using inductive approaches combined with system thinking materials. This suggests that system thinking helps learners connect their prior knowledge with new grammar concepts. Previous literature, such as Alharbi (2022), supports the idea that organizing and connecting learners' knowledge can enhance their understanding of new material.

Table 5. One-sample test control group

	Test value = 0					
					95% confidence interval of the difference	
	t	df	Sig. (2-Tailed)	Mean difference	Lower	Upper
Pre_test_grammer_Control_Group	15.037	25	0.000	32.885	28.38	37.39
Post_test_grammer_control_Group	14.245	25	0.000	43.269	37.01	49.53

Source(s): Author's own work

5. Limitations and future implications

While this study offers valuable insights into the effects of using inductive methods based on system thinking to enhance grammar learning, it also presents some limitations. One such limitation is that the study focused exclusively on secondary EFL students. Additionally, all participating teachers and learners were female, which may restrict the generalizability of the findings.

Given these limitations, future studies should explore the impact of inductive methods based on system thinking in grammar learning across different grade levels and age groups. It would also be beneficial to conduct research with male students to determine whether the outcomes differ by gender. Furthermore, further studies should analyze the characteristics of instructional materials that support system thinking in EFL learning. Since the design of materials directly influences the teaching methods used, EFL teachers must understand the features of innovative tasks that are conducive to EFL learning.

The implications of this research suggest a positive achievement for Saudi learners EFL grammar. The inductive method employed in this study encouraged active learner engagement and facilitated meaningful learning within an EFL environment. As a result, these findings may inspire EFL teachers to adopt more innovative materials that promote student involvement in EFL learning.

6. Recommendations

The study recommends that EFL teachers incorporate inductive materials based on system thinking to improve grammar learning. It also advises selecting and designing materials and activities that encourage learners to engage in deep thinking and make connections between concepts. EFL teachers should create tasks that stimulate critical thinking and significantly enhance learners' comprehension in EFL contexts. Additionally, teachers should be supported with professional development opportunities, such as workshops and training, to help them design materials that foster independence and self-learning in students. The materials should be grounded in system thinking, enabling learners to integrate various types of knowledge and develop new insights through deep thinking and understanding the relationships between concepts.

7. Conclusion

This present study investigated the effects of using inductive methods based on system thinking to enhance grammar learning. The results reported that the experimental group benefited from the inductive approach in their grammar learning. Moreover, the study highlighted the importance of using materials that incorporate system thinking. The findings suggest the implementation of such materials to encourage creativity and promote reflective thinking in learners. It is crucial to recognize that the preparation of well-designed materials significantly influences the learning process, motivating EFL learners to participate actively in class. Overall, the study underscores the positive impact of inductive materials that foster system thinking on EFL grammar learning.

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