USING FEYNMAN TECHNIQUE IN ENGLISH GRAMMAR TEACHING AND LEARNING AT HIGH SCHOOLS

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ABSTRACT

The purpose of this study is to explore whether the Feynman technique is suitable for high school students in Vietnam and whether implementing it is effective in improving their grammar performance. 40 students at grade 11 in a local high school were invited to join in the project, in which the experimental group of 20 students participated in an 8-week treatment, in which they were required to apply the Feynman technique, including 4 steps: Identifying the topic, Teaching it to yourself or someone else, Identifying knowledge gaps, and Simplifying, to learn grammar with a frequency of one unit per week. In addition, a pre-questionnaire was given before the experiment to gather information related to students' perceptions, practices, and difficulties when learning grammar. The results of the pre-test and post-test showed that the students' grammar ability was significantly enhanced after using the Feynman technique. Moreover, the post-questionnaire showed participants' positive attitudes toward the Feynman technique. Therefore, it is suggested that the Feynman technique should be used more frequently in teaching and learning grammar to improve grammar performance of high school students.

SỬ DỤNG KỸ THUẬT FEYNMAN TRONG DẠY VÀ HỌC NGỮ PHÁP TIẾNG ANH Ở TRƯỜNG TRUNG HỌC PHỔ THÔNG

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TỪ KHÓA

Kỹ thuật Feynman
Ngữ pháp tiếng Anh
Năng lực ngữ pháp
Dạy và học
Học sinh trung học phổ thông

TÓM TẮT

Nghiên cứu này mang mục đích khám phá xem liệu phương pháp Feynman có phù hợp với học sinh trung học phổ thông ở Việt Nam hay không và liệu việc áp dụng kỹ thuật này có đem lại hiệu quả trong việc cải thiện khả năng ngữ pháp của các em học sinh. 40 học sinh lớp 11 ở một trường trung học được mời tham gia dự án, trong đó nhóm thực nghiệm gồm 20 học sinh đã tham gia vào quá trình tác động kéo dài 8 tuần, trong đó họ được yêu cầu áp dụng kỹ thuật Feynman, bao gồm 4 bước thực hiện: Xác định chủ đề, Giải thích lại nội dung, Xác định khoảng trống kiến thức và Đơn giản hóa, để học ngữ pháp với tần suất một bài mỗi tuần. Ngoài ra, một bảng câu hỏi khảo sát đã được đưa ra để thu thập thông tin liên quan đến nhận thức, sự luyện tập và khó khăn của học sinh khi học ngữ pháp. Kết quả của bài kiểm tra trước và sau thực nghiệm cho thấy khả năng ngữ pháp của học sinh được cải thiện đáng kể sau khi sử dụng kỹ thuật Feynman. Hơn nữa, bảng câu hỏi khảo sát sau thực nghiệm cho thấy thái độ tích cực của các học sinh đối với kỹ thuật Feynman. Do đó, kỹ thuật Feynman được đề xuất sử dụng thường xuyên hơn trong việc giảng dạy và học ngữ pháp để cải thiện kết quả ngữ pháp của học sinh trung học phổ thông.

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1. Introduction

Nowadays learning English is widely accepted a common and effective way to acquire knowledge from manifold sources around the world. This means mastering English becomes essential for the future of students, and to be proficient in English, learners need to master all 4 skills of listening, speaking, reading and writing, along with 3 elements namely pronunciation, vocabulary and grammar.

Among them, grammar is an important element that every learner needs to grasp in order to communicate efficiently in the language. As Brown (1994) defines, grammar is a set of rules and conventions that control the traditional structure, sequence, and connection of words in a sentence, allowing any foreign language to be learned and acquired anywhere in the world while also creating overall linguistic competency [1]. Additionally, according to Singh (2011), grammar is one of the most important aspects of a language since it affects the precision and clarity of the language [2]. This is accomplished via phonologically creating, syntactically building, and morphologically characterizing language, among other techniques. Without adequate knowledge of how language works, learners cannot advance their language skills. As a consequence, the greater understanding one possesses regarding the structure and role of the components comprising a sentence, the more proficient they become in identifying and creating well-crafted sentences, as stated by Emery et al. (1978) [3]. All in all, grammar's role is indispensable in English, so learners have to be proficient for correct speech and successful communication.

However, students normally face with various difficulties in learning grammar. The maximum possible intellectual aptitude via the students' skills, which is essential for grammatical learning, is needed to comprehend and apply English grammar rules. Students must understand how grammar is utilized to express oneself as well as how others perceive their communication style [4]. When writing in English, students commonly commit grammatical mistakes [5]. Al Mekhlafi & Nagaratnam (2011) considered that grammar is frequently cited in the classroom as a source of discomfort for students while creating numerous words in English, and they may feel under pressure to learn English as a result of the grammar [6]. Grammar, according to Ameliani (2019) and Quirk et. al. (2000), acts as a complicated system in which its structural components all serve the same goal yet learners struggle to differentiate one from the other [7]. Not only students but also teachers cope with challenges when teaching grammar. As discussed by Berman (2018), one of the most significant challenges in most English instructors' grammar training is a lack of standards among their students [8]. It demonstrates that the pupils disregard the most fundamental and straightforward grammar principles, including their structural patterns, which they must have previously learned. Groves (2013) emphasized that having weak pupils in class is common, but English teachers should not be concerned or give up [9]. Several actions may be carried out in order to pique their attention or, in other words, to make the teachings more relevant like applying active learning or learner-centered approaches.

Recently active learning has been included in language teaching; it has arisen as a pedagogical strategy that stresses various modalities of education and learning settings throughout the previous two decades. Active learning has been acknowledged as a powerful instructional strategy and pedagogical approach for increasing student learning and motivation [10]. The basic concept of active learning, in particular, promotes student participation in activities that result in increased levels of learning, motivation, and accomplishment [11]. Active engagement is required because "students must participate in such higher-order thinking processes as analysis, synthesis, and assessment," according to Bonwell and Eison (1991) [12]. They also highlighted the significance of involving students in active participation that requires them to engage in complex cognitive processes such as analysis, synthesis, and evaluation. In an active learning scenario, learners can employ a variety of active learning methodologies that are appropriate for their learning styles and needs [13]. Some of them can be listed are one minute paper/free write, brainstorming, collaborative writing, SQ3R, concept maps and Feynman technique.

Among many learning strategies stated above, Feynman technique is one of the noticeable methodologies. The Feynman technique was created by Richard Feynman, a physicist who received a Nobel Prize for his work in quantum mechanics and particle physics. The Feynman technique is a tool to remember what learners have read by explaining it in simple, understandable language. To simplify complex concepts, this technique aims to help learners explain them in a way that a child could comprehend, according to Reyes (2021) [14]. Zhao, Miao, and Liu (2020) divided the Feynman technique into two main phases: first, it uses the idea of "output learning" to "reinterpret this concept fluently"; second, it uses the output method to "change the representation form of knowledge" to "Use simple words to explain, use other things to analogize it, so that 10-year-old children can fully understand" [15]. The Feynman technique comprises 4 steps (figure 1): Identifying the topic, Teaching it to yourself or someone else, Identifying knowledge gaps and Simplifying.

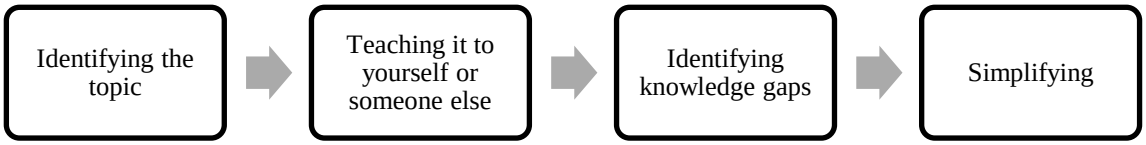

Figure 1. *Steps in Feynman's technique*

The Feynman learning technique is described as a "teaching-based" learning strategy with "simulation teaching" as its primary component [15]. This group of researchers also claimed that it would be a highly useful and practical teaching strategy to use Feynman technique to alter education and teaching techniques as this method improves students' understanding of and mastery of knowledge, better utilizes the rich educational resources of the Internet, and fosters students' independent learning customs; therefore, the objective of "learning by teaching, learning by applying" might be accomplished.

2. Research methods

40 participants at grade 11 in a local high school in the North of Vietnam were selected for the study. A pre-questionnaire was distributed to the students during the first week of the study to collect students' ideas toward studying English grammar. The pre-questionnaire was purposefully designed with 4 parts: personal information, students' perceptions of English grammar and learning English grammar, students' practice of English grammar and students' difficulties when learning English grammar. The pre-questionnaire included 17 close-ended and 2 open-ended questions. At the end of the treatment, students were given a post-questionnaire to collect data about their attitudes towards the Feynman technique applied in teaching and learning English grammar. The post-questionnaire consists of three sections and a total of nine questions. Participants were first asked how they felt about the technique, then were requested to rate the Feynman technique's efficiency in enhancing their grammar skills and finally were asked to assess the Feynman technique's performance in areas that beyond grammar learning. Part 4 investigated about the participants' expectations for the experimental course. There are 5 choices for each question. Participants' responses were graded using a Likert scale and interpreted into 5 levels of agreement [16].

Two grammar tests before and after the intervention were used to assess students' grammar knowledge and competence. The pre-test and post-test shared similarities in structure, with a total of 20 questions for each test, including 15 multiple-choice questions and 5 short-answer questions. Participants' scores were categorized according to Article 9 of the Regulation on Evaluation and Ranking of Students in Lower and Upper Secondary Education issued in accompany with Circular No. 22/2021/TT-BGDDT [17]. The learning results are classified into four levels: Excellent, Good, Qualified, Unqualified.

3. Results and discussion

3.1. Students' perception, practice and difficulties when learning grammar

Table 1. *Students' opinions about perception of English grammar and learning English grammar*

Statements	Mean	Level of agreement
1. In my opinion, grammar is very important to learn.	4.71	Strongly agree
2. Learning grammar is very difficult.	4.46	Agree
3. I found that learning grammar is boring.	4.12	Agree
4. I am attentive in grammar lessons.	3.17	Neutral
5. Learning grammar can help me improve other skills such as listening, reading, speaking, and writing.	4.54	Strongly agree
6. Grammar is not important in oral communication.	2.34	Disagree
7. If I pay more attention to learning English grammar, it will help me to obtain better scores.	3.8	Agree
8. After I have learned English in the classroom, I gradually develop confidence in learning grammar.	2.93	Neutral
9. I use existing grammatical knowledge to help me understand new grammar that I learn.	3.76	Agree
10. If I have a chance, I would like to take more courses in English grammar.	2.88	Neutral

Table 1 demonstrates students' opinions about perception of English grammar and learning English grammar. Overall, the students had a positive perception of the importance of English grammar in language learning with a mean score of 4.71 for statement 1, which implies that students strongly agree that it is necessary to learn grammar as it is one of the most crucial skills. Similarly, they recognized the benefits of learning grammar for improving other skills such as listening, reading, speaking, and writing, with an average score of 4.54, showing their strong agreement with this statement.

However, the participants also perceived English grammar as a difficult and boring subject. When it comes to the idea that learning grammar is very difficult, there is a mean score of 4.46 which means that students primarily agreed with this viewpoint. Also, they generally agreed that they found learning grammar monotonous as it is proved by the mean score of 4.12 for this statement.

Regarding the students' engagement in grammar lessons, the data shows that they were mostly neutral with the idea that they are attentive in grammar lessons, with an average score of 3.17 for the statement 4. Similarly, the statement 8 had an average score of 2.93, indicating a neutral stance of participants for the idea that after learning English in the classroom, they gradually develop confidence in learning grammar.

The students recognized the importance of grammar in academic performance, with an average score of 3.8 for the statement 7, suggesting that students agree that if they pay more attention to learning English grammar this perception, they can obtain better scores. Additionally, they reported using existing grammatical knowledge to help them understand new grammar, rating the statement 9, with an average score of 3.76, indicating agreement.

Finally, the students neither disagree nor agree that they are interested in taking more courses in English grammar, with a mean score of 2.88 for the statement 10.

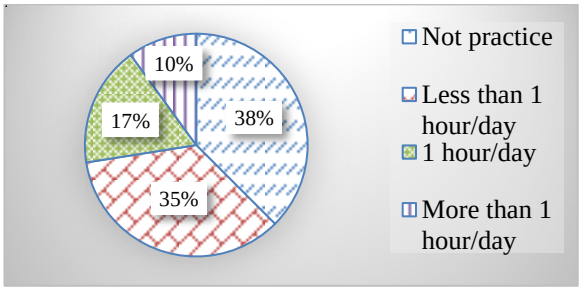

Figure 2. *Frequencies of students' practice English grammar at home*

Figure 2 indicates the frequencies of students' practice English grammar at home. The data depicts that a significant percentage of students (37.5%) do not practice English grammar at all. Of those who do practice, the majority (35%) practice for less than an hour per day and 17,5% is the percentage of students who spend an hour practicing grammar. This suggests that many students may not be dedicating enough time to practicing English grammar to see significant improvement in their proficiency. Only a small percentage of students (10%) practice English grammar for more than an hour per day.

Table 2. *Student's out-of-class activities for learning grammar*

Student's out-of-class activities for learning grammar	Percentage (%)
1. Doing paper grammar exercises	87.5
2. Learning grammar books	45
3. Playing grammar games	7.5
4. Speaking in English	0
5. Reading in English	0
6. Translating documents	0
7. Learning grammar through apps and websites	2.5
8. Writing dairy in English	0

According to the survey results as shown in table 2, the most popular activity for learning grammar at home was doing paper grammar exercises, with 87.5% of students choosing this activity. The figure for the second most popular activity, learning grammar from books was 45%, six times than that of the third most common activity, playing games related to grammar, while just 2.5% was registered in the proportion of students who learning grammar through apps and websites. It is also noticeable that speaking in English, reading in English, translating English documents, and writing diaries in English were not preferred by any of the students. The results of this survey indicate that students prefer traditional methods of learning grammar, such as doing paper grammar exercises and learning from books, over modern methods such as using apps and websites. By mainly practicing exercises on paper and grammar books, students learn English mechanically.

Table 3. *Students' opinions about difficulties when learning English grammar*

Statements	Mean	Level of agreement
1. It is difficult for me to remember grammar rules and structures.	4.49	Agree
2. A lot of grammar patterns are hard to obtain.	4.56	Agree
3. I find it difficult to handle and apply grammar patterns presented within authentic texts.	4.54	Strongly agree
4. I find it hard to pay attention in grammar lessons.	3.29	Neutral
5. I don't like to self-learn grammar rules and structures.	4.66	Strongly agree
6. Learning grammar is stressful for me.	4.17	Agree

Table 3 presents data on students' opinions about difficulties when learning English grammar. The results show that the majority of students agree that they find it difficult to remember grammar rules and structures, with an average rating of 4.49 for statement 1. Similarly, the mean score of 4.56 for statement 2 denotes that participants agreed that they are particularly struggling with some certain grammar patterns. Furthermore, students strongly agreed that they struggle with understanding and applying grammar patterns in real-life situations, proved by an average score of 4.54 for statement 3. On the other hand, students had a neutral response to statement 4 with the average score standing at 3.29, showing that they do not find grammar lessons particularly engaging or motivating. Moreover, with the mean score of 4.66 for statement 5 participants generally expressed their strong agreement with the fact that self-directed grammar learning is not a comfortable task. Lastly, in statement 6 the mean score is 4.17 signifies that they may feel overwhelmed or anxious when learning grammar.

3.2. Students' current grammar level

Table 4. *The classification of students' scores on pre-test*

No	Classification	Score	Experimental group		Control group	
			Frequency	Proportion (%)	Frequency	Proportion (%)
1	Excellent	8.0-10	2	10	3	15
2	Good	6.5-7.9	3	15	3	15
3	Qualified	5.0-6.4	8	40	7	35
4	Unqualified	0-4.9	7	35	7	35
	Total		**20**	**100**	**20**	**100**

Table 4 shows the results of the pre-test, which reflects the current level of grammar proficiency. Specifically, the "Qualified" category has the highest frequency in both groups, with 40% in the experimental group and 35% in the control group. In contrast, the lowest proportion is recorded in the "Excellent" category, with only 2 students in the experimental group and 3 students in the control group, resulting in percentages of 10% and 15% for the experimental and control groups, respectively. Furthermore, the second-highest proportion belongs to the "Unqualified" category, with a figure of 35% corresponding to 7 participants in both groups. A similarity in percentage is also observed in the "Good" category, with 15% of students being classified in this category in both groups. Based on these proportions, it can be seen that a significant ratio of students had poor grammar performance, with just around one-third of the total students being classified as good or excellent learners regarding grammar.

3.3. Improvement of students after using Feynman technique to support grammar learning and teaching process

Table 5. *The classification of students' scores on post-test*

No	Classification	Score	Experimental group		Control group	
			Frequency	Proportion (%)	Frequency	Proportion (%)
1	Excellent	8.0-10	6	30	3	15
2	Good	6.5-7.9	10	50	3	15
3	Qualified	5.0-6.4	3	15	8	40
4	Unqualified	0-4.9	1	5	6	30
	Total		**20**	**100**	**20**	**100**

Table 5 shows the results of the test. Overall, there are clear differences in the data of both groups. The highest proportion, which is 50%, belongs to the "Good" classification in the experimental group, while the percentage for this classification in the control group is only 15%. Furthermore, the number of students classified as "Excellent" in the experimental group is 6, equivalent to 30% of participants, which is double that of the control group. In contrast, the frequency of the two remaining classifications is higher in the control group than in the experimental group. While 40% of students in the control group are classified as "Qualified", only 15% of students in the experimental group are placed in that classification. Additionally, the number of students considered "Unqualified" in the experimental group is only one-sixth of that in the control group, with the proportion of the former and the latter respectively standing at 5% and 30%.

Table 6. *The comparison of Pre-Test and Post-Test*

	Pre-test		Post-test	
	Mean score	**Classification**	**Mean score**	**Classification**
Experimental group	5.18	Qualified	7.35	Good
Control group	5.3	Qualified	5.6	Qualified

Table 6 shows that the average scores of participants in both groups were relatively similar and classified as "Qualified" before applying the Feynman technique, with scores of 5.18 and 5.3

for the experimental group and control group, respectively. After applying Feynman, significant disparities were observed in the pre-test and post-test mean scores of the experimental group and the post-test scores of the control group. The experimental group had an average score of 7.38, almost one and a half times higher than the control group, whose mean score was 5.6. Therefore, the experimental group's grammar performance was classified as "Good", higher than that of the control group, which remains unchanged after the experiment.

Additionally, participants' grammatical performance significantly advanced after undergoing treatment. This development is shown by in the disparity of 2.17 between the experimental group's pre-test and post-test mean scores. Meanwhile, the control group also showed progress despite not involving in the experiment, as evidenced by the average post-test score of this group being 0.3 points higher than its average pre-test score. This means that students still developed their grammar skills through conventional lessons; however, pupils' advancement was not as sharp as that of the experimental group.

3.4. The attitude of students toward Feynman technique

Table 7. *Students' attitude of students toward Feynman technique*

Categories	Statements	Mean	Level of agreement
Participants' feelings about the Feynman technique	1. I am interested in improving your grammar through the Feynman technique.	4.68	Strongly agree
	2. I find the Feynman technique an easy way to improve my grammar.	3.50	Agree
	3. I'd like my teacher to continue using the Feynman technique in my class.	4.21	Agree
Participants' assessment of the effectiveness of the Feynman technique in improving grammar performance	4. I find the Feynman technique effective in improving my grammar	4.65	Strongly agree
	5. My grammar is improved after the experimental course.	4.47	Agree
Participants' recommendation of using Feynman technique for other fields	6. I will use the Feynman technique to improve other English skills.	3.95	Agree
	7. I will apply the Feynman technique for self-study.	4.51	Strongly agree
	8. I will use the Feynman technique in learning other subjects.	4.33	Agree
Participants' satisfaction of the experimental course	9. I had chances to try new roles in my class and it's fun.	4.42	Agree
	10. Overall, I'm happy with the skills I earned during the experimental course.	4.38	Agree

Table 7 illustrates students' attitude toward Feynman technique in terms of feeling, assessment of the effectiveness, recommendation of using Feynman technique for other fields, and satisfaction of the experimental course. As shown in the table, overall, the participants gave positive feedback about the Feynman technique. To begin with, nearly all respondents strongly agreed that they were interested in and enthusiastic with using Feynman technique to aid their grammar learning process. Statement 2 received an average rating of 3.50, indicating students' agreement that the Feynman technique was an easy way to improve their grammar. However, this score is nearly to the score of neutral level, it seems that while participants found the technique helpful, some of them might have faced some challenges in applying it or may require more guidance and practice to fully master the technique. The mean score of the statement 3 is 4.21 indicating that participants would appreciate their teachers using the Feynman technique in their classes.

Regarding the participants' assessment of the effectiveness of the Feynman technique in improving grammar performance, the majority of participants acknowledged the effectiveness of the Feynman technique in enhancing their grammar with the mean score of 4.65 for the statement 4, indicating strong agreement among the participants. Moreover, the participants also reported

an improvement in their grammar after the experimental course, with a mean score of 4.47 for the statement 5.

With regards to participants' assessment of the effectiveness of the Feynman technique beyond grammar learning, the mean score of statement 6 is 3.95, indicating agreement among the participants that the Feynman technique was a feasible method for developing other English skills. In the statement 7, the mean score is 4.51 implying that students generally strongly agreed about using the Feynman technique for self-learning purposes. Furthermore, participants commonly expressed their agreement with the mean score of 4.33 for the statement 8, showing their willingness to apply the Feynman technique in the process of learning other subjects.

When it comes to participants' satisfaction of the experimental course, the participants expressed their contentment with their new roles and the skills they have developed in the course with an average score of 4.42 and 4.38 respectively.

After 8 weeks of the experiment, the experimental group who received special treatment by applying the Feynman technique in teaching and learning grammar recorded significant changes in the results. Not only did the average score increase remarkably, placing grammar performance in "Good", but participants in experimental group also showed a superiority to those in control group in terms of mean score in the post-test. This means the Feynman technique can enhance the learning and teaching grammar process, and the improvement when applying this method is sharper than conventional methods.

When it comes to the attitude of students toward Feynman technique, most students responded positively. They found it interesting to learn grammar through this method and felt that it was an effortless way to improve their grammar performance. However, some participants may have encountered challenges in applying the technique and may need more guidance and practice to fully master it. Nonetheless, they expressed support for continuing to use the Feynman technique in class lessons. Additionally, many of them felt that the technique was effective and had significantly improved their grammar skills after the treatment. They also showed a willingness to apply the Feynman technique not only in English learning but also in other subjects and for self-learning purposes.

The post-test and post-questionnaire results not only demonstrate the positive impacts of using the Feynman technique in teaching and learning grammar, but also boost learners' confidence in their own abilities. Moreover, the use of the Feynman technique shifts the learners' role from passive receivers of knowledge from teachers to active seekers and teachers of knowledge to others. The improvements in the grammar performance of high school students after the intervention provide a basis for more frequent application of the Feynman technique not only in grammar learning but also in other areas. The Feynman technique is an effective tool for lifelong learning purposes. Furthermore, the increase in grammar scores enables learners to feel more positive and confident about their abilities, encouraging them to make greater efforts to achieve even greater success in their studies and in life.

4. Conclusion

This quasi-experimental research illustrates the potential application of Feynman technique in teaching and learning English grammar in Vietnamese high schools. The improvement of grammar test results of the experimental group indicates the effectiveness of this active learning method in learning grammar. This is consistent with the findings of previous studies carried out by Alfareza (2022) [18] and Harahap (2021) [19]. Students' positive attitudes toward the use of Feynman technique suggest its meaningfulness, practicability and appropriateness in aiding student's grammar learning. The recommendation for further use of Feynman technique in English grammar teaching and learning is aligned with the trend of maximizing students' active learning and empowering learners and learning in all fields of education.

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