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Enhancing Thinking Skills in Thai EFL Learners through Sternberg's Triarchic Theory integrated in English Grammar Instruction

Saowaluk Wongrat and Saneh Thongrin*

Faculty of Liberal Arts, Thammasat University, Thailand

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* Corresponding author
E-mail address:
saneh.t@arts.tu.ac.th

Abstract

Effective thinking skills, crucial for success in today's dynamic world, empower learners to analyze information critically, solve problems creatively, and make informed decisions. However, Thai middle/high school students often face challenges developing these skills within language classrooms. This study investigated the effectiveness of incorporating Sternberg's Triarchic Theory of Intelligence (Sternberg, 1985, 1996, 2001) into grammar instruction provided to a group of 21 ninth-graders enrolled in Basic English 5 at a leading public school in Bangkok, Thailand, in 2021. Data collection included a researcher-developed Thinking Skills Test developed from O-NET (2015-2018) and PISA 2018 (OECD, 2018) test content, classroom observations of grammar instruction utilizing the four-stage lesson plan, an attitude survey, and semi-structured interviews. Findings revealed that participants perceived the Critical-Analytical aspect of the Triarchic Theory as particularly beneficial for their grammar learning. They expressed highly positive attitudes towards this type of thinking and somewhat positive attitudes towards Creative and Practical thinking. The study suggests that integrating thinking skills can enhance language learning, fostering a connection between grammar and other language skills. These results offer valuable insights for developing English language curricula in middle schools and contribute to research exploring the interdependence of thinking skills and language education for EFL learners.

1. Introduction

In today's rapidly changing world, effective thinking skills are crucial for success. These skills enable individuals to analyze information critically, solve problems creatively, and make sound decisions. Developing thinking skills has long been a central goal of education (Arango et al., 2018; Báez, 2004; Nold, 2017). Thailand's Basic Education Core Curriculum (Ministry of Education, 2008) emphasizes the importance of thinking across subjects, aiming to foster learners who are analytical, synthetic, and critical thinkers. Thinking skills are particularly important for language learners. While fluency in conversation is important, a strong grasp of English grammar is a crucial foundation for effective communication and lifelong learning (Richards, 2001). Grammar provides the framework for constructing clear and concise sentences, ensuring messages are understood as intended (Ellis & Johnson, 1994). It goes beyond rote memorization of rules; it equips learners with the ability to analyze language structures, identify errors, and ultimately, express themselves with greater accuracy and sophistication (Nation, 2008).

Effective grammar instruction in the classroom can foster critical thinking skills in Thai middle school students. This is especially important as they navigate learning a new language's structures alongside developing critical thinking (Alidmat & Ayassrah, 2017; Thornbury, 2007). Integrating Robert Sternberg's Triarchic Theory of Human Intelligence (1985) offers a promising approach. Aligning with cognitive teaching methods, this theory proposes three intelligences: analytical (analyzing components), creative (applying knowledge in new ways), and practical (using knowledge in real-world contexts) (Sternberg & Swerling, 1996; Vinney, 2020). What makes this theory valuable is its emphasis on applying knowledge in real-world contexts.

However, two limitations hinder the application of the Triarchic Theory in English language learning research. One is the lack of research in lower secondary education. While the theory has been explored in various contexts (Begley, 1992; Zhang & Sternberg, 2000), few studies investigate its application within the four-stage lesson plans (Do Now, Purpose, Work Mode, Reflective Thinking) common in this age group (Graham et al., 2017). This gap is significant because lower secondary students are at a crucial stage for building foundational language skills (Larsen-Freeman, 2013). Integrating the Triarchic Theory within these familiar structures could enhance learning by fostering critical thinking alongside grammar acquisition.

Another even more critical research gap exists regarding student attitudes towards grammar learning through the Triarchic Theory's three thinking modes (analytical, creative, and practical). While research explores general student attitudes towards grammar (MacIntyre, 1999; Oxford, 1990), few studies examine student perceptions of, and willingness to engage with, grammar exercises designed to specifically target these

thinking skills (Yang & Wu, 2018). Understanding student attitudes towards this approach is crucial to gauge its potential success and inform the design of future grammar instruction.

Therefore, integrating the Triarchic Theory into learning management through well-structured lesson plans could be highly beneficial for educational systems (Sternberg, 1996; Sternberg & Swerling, 1996). As Sternberg & Swerling (1996) assert, "students learn better when they think effectively about the material they are learning" (p.2), and "to be intelligent is to think well in one or more of three different ways: analytic, creative, and practical" (p. 7). This study consequently explores the potential of Robert Sternberg's Triarchic Theory of Intelligence (Sternberg & Swerling, 1996) to develop analytical, creative, and practical thinking skills in intermediate English grammar learners specifically within the framework of a four-stage lesson plan. This research is guided by two key questions:

1. To what extend do students improve their grammar learning after participating in the English grammar instruction informed by the Triarchic Theory?

2. What are students' attitudes towards learning English grammar informed by the Triarchic Theory?

The findings offer a lens for investigating how these specific thinking skills can be fostered within the context of English grammar learning.

2. Literature Review

2.1 Teaching Approaches for Developing Thinking Skills

Thinking skills can be defined in many different ways. Primarily defined in psychological perspective, the term includes a number of core thinking that form the foundation for more complex cognitive processes (Pashler et al., 2007), such as attention (Santrock, 2020), memory (Baddeley, 2007), analysis (Bransford et al., 2000), problem-solving (Newell & Simon, 1972), and decision-making (Bechara et al., 1994). Such core thinking skills are closely applied to educational practice. They play a crucial role in engaging learners with new information (Adeyemi, 2017), building a deeper understanding of concepts and making connections between ideas (Facione, 1990). Effective thinking skills are also essential for transferring knowledge to new situations (Bransford et al., 2000), and empowering learners to become self-directed and think critically for themselves (Adeyemi, 2017).

Several instructional approaches can foster thinking skills in the classroom. Johnston et al. (2011) categorize these approaches based on how thinking skills are developed and applied. The first is the enrichment approach, which focuses on developing general thinking skills through dedicated programs like Feuerstein Instrumental Enrichment

(FIE) (Higgins, 2015). Enrichment programs provide targeted activities to enhance cognitive abilities. Another approach is infusion integrating thinking skills directly into existing curriculum content. For example, Edward de Bono's "Six Thinking Hats" framework (Higgins, 2015) encourages students to consider different perspectives while tackling a problem. The third one is the dispositional approach, aiming to cultivate a "thinking disposition" in students. By encouraging students to go beyond their perceived limitations and embrace challenges, this approach fosters a love of learning and critical thinking (Tishman & Andreade, 1995). These approaches can significantly enhance student learning by equipping them with the necessary skills to analyze information, solve problems, and think critically.

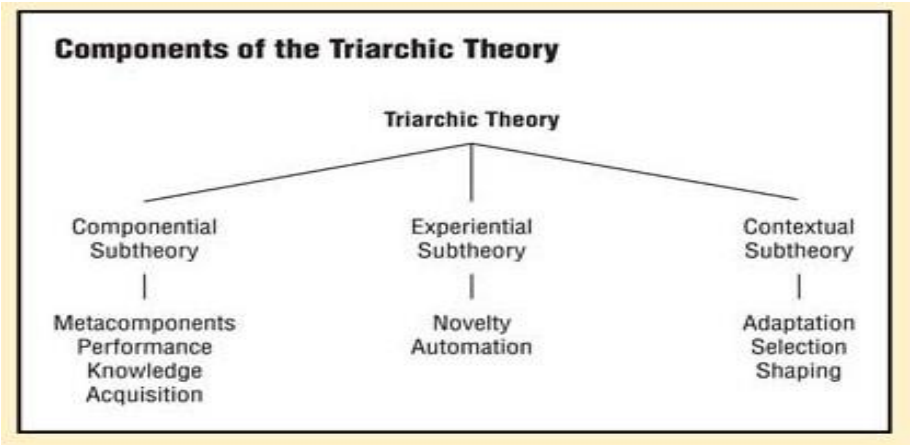
In addition, the concept of human intelligence has been explored from various viewpoints. Traditionally, psychologists like Lewis Terman and Edward L.Thorndike offered distinct, binary definitions: Terman, emphasizing the ability to think abstractly, and Thorndike, focusing on learning and the ability to provide effective responses. However, modern psychologists generally agree that intelligence is about adaptation to the environment (Sternberg, 2020). This perspective suggests that intelligence is the ability to receive information, process it effectively, and generate sound solutions. As Sternberg (1990) highlights, various theories of intelligence exist, and a review of those will be the focus of this section in the context of the present study.

2.2 Triarchic Theory as Intelligence

The Triarchic Theory of Human Intelligence (Sternberg, 1985) offers a unique perspective on cognitive processing. It suggests a common set of underlying mental processes that fuel all aspects of problem-solving, regardless of cultural background. While the solutions considered 'intelligent' may differ across cultures, the fundamental need to define problems and develop strategies to solve them remains universal. The theory is comprised of three subtheories, each contributing to a distinct type of intelligence (Fig. 1.1). The first is Componential Subtheory (Analytical Intelligence). It focuses on the mental processes involved in analyzing information and solving problems effectively (Sternberg & Swerling, 1996). It essentially equips us with the critical thinking skills to evaluate situations and find solutions. The second subcategory is Experiential Subtheory (Creative Intelligence), emphasizing the ability to generate new ideas and think outside the box. It fuels our creativity and allows us to approach problems from novel perspectives (Sternberg & Swerling, 1996). Third, Contextual Subtheory (Practical Intelligence) highlights the ability to adapt to different contexts and apply our knowledge effectively in real-world situations. It's essentially our 'street smarts' that help us navigate daily life (Sternberg & Swerling, 1996).

Figure 1

Components of the Triarchic Theory (Sternberg, 1985, p. 109)



Note. From *Beyond IQ: A Triarchic Theory of Human Intelligence* (p. 109), by R. J. Sternberg, 1985, Cambridge University Press

These subtheories, though distinct, are interrelated. They represent three crucial aspects of intelligence: the Internal World, referred to as an individual's mental processes and cognitive abilities, the External World, which is the environment and context in which an individual operates, and the Experience of the Individual, considering how an individual's past experiences influence their approach to problems. These interconnected sub-categories allow individuals to leverage all three types of intelligence – analytical, creative, and practical – depending on the specific situation they face.

2.3 Approaches to Teaching English Grammar

Effectively teaching English grammar involves a thoughtful balance between different approaches. While traditionally, the focus was on rote memorization of rules or grammar-translation method (Richards, 2001), more innovative approaches emphasize communication and active learning, known as communicative language teaching or CLT (Littlewood, 2014).

In Grammar-Translation Method, teachers tended to focus on explicit grammar rules and their translation equivalents in the target language. Students practice drills and exercises to memorize rules and sentence structures (Richards, 2001). Unlike this traditional approach, Communicative Language Teaching (CLT) emphasizes communication and using language in real-world contexts. Grammar is taught implicitly through meaningful tasks and activities that encourage students to use the language functionally (Littlewood, 2014). As a result, a number of teachers try to find success by combining elements of both

traditional and more innovative approaches. For instance, in English for Secretaries, teachers might explicitly introduce a grammar rule before having students practice it through communicative activities. This provides a clear foundation while fostering practical application.

There are two more interesting approaches to grammar instruction. It has been debated whether grammar should be taught through a deductive or inductive approaches. Deductive approaches present the rule first, followed by examples. However, inductive approaches lead students to discover the rule through examples (Thornbury, 1999). Teachers can choose the approach that best suits their students and learning objectives. Also, the Technology-Assisted Learning approach accounts grammar instruction. Online platforms and interactive exercises can supplement traditional grammar instruction and provide engaging practice opportunities (Chapelle, 2015).

In classroom teaching, it could be very difficult to define the “best” approach to teaching English grammar as it depends on various factors including teacher belief, student age, level, learning styles, and curriculum objectives. However, by combining traditional and modern methods, integrating critical thinking skills, and considering innovative resources, teachers can create a well-rounded learning experience that fosters both grammatical knowledge and the ability to use language effectively.

2.4 Integrating Triarchic Theory in Grammar Instruction

Sternberg’s Triarchic Theory (Sternberg, 2001) provides a framework for integrating analytical, creative, and practical thinking into grammar lessons. These components include 3 aspects of thinking. The first is analytical thinking, where students judge, evaluate, compare and contrast information, and critique language usage (Sternberg, 2001). In teaching, teachers need to help students to achieve this aspect. After students read a passage or learn language, teachers can guide students to analyze character relationships by drawing a family tree and discussing character motivations (Sternberg, 2001). This activity combines grammar skills (e.g., past tense verbs) with critical thinking about plot and character development. In another example, teachers can encourage students’ analytical thinking using comparative texts, asking them to compare and contrast different writing styles by analyzing sentence structure and vocabulary choices in various texts (Alidmat & Ayassrah, 2017). This activity encourages analytical thinking through identifying patterns and stylistic differences. The use of analytical thinking skills in grammar teaching could also be demonstrated in the study by Alidmat and Ayassrah (2017), investigating critical analysis of grammar through carefully chosen writing tasks fostering critical thinking skills in Maritime English students at Aqaba College in Jordan. Their qualitative study, using in-depth interviews with 10 final-year undergraduate students, revealed a disconnect between the writing tasks and the intended development of critical

thinking skills. The tasks, the study found, focused more on mechanics than on encouraging critical thought (Alidmat & Ayassrah, 2017). Although the researchers demonstrated the benefits of critical thinking in grammar instruction for college students, applying these findings to the present study with younger learners might require further investigation. The effective use of analytical thinking could also be found in a problem-based learning (PBL) approach Chiou (2019) used in enhancing grammar competence and motivation in low-achieving English learners. This study involved 50 students divided into teams and assigned a scenario-based task related to relative clauses. The research employed a pre-test/post-test design, classroom observation checklists, and writing assignments. The results showed a significant increase in student engagement and grammar skills in the PBL group compared to the control group. Interestingly, the study also found that student-generated solutions often emphasized employment-related aspects, potentially reflecting their real-world priorities.

In the second aspect of thinking, creative thinking, students invent, discover, imagine, and suppose, applying grammar in novel ways (Sternberg, 2001). Here teachers can incorporate a number of activities to foster students' creative thinking. Teachers can let students to write a letter describing a special event to a friend who couldn't attend, fostering empathy and creative storytelling while using specific grammatical structures (Sternberg, 2001). Also, with teachers' guidance, students brainstorm catchy headlines for a newspaper article based on a story, applying creative thinking and conciseness while considering audience engagement (Sternberg, 2001). Students can even be challenged in a problem-based approach by creating scenarios where they must apply specific grammatical structures to solve real-world challenges (Chiou, 2019). This fosters creative thinking and reinforces practical application of grammar. This focus on fostering creativity aligns well with the approach advocated by Thornbury (2007) in his book, *Teaching Grammar Creatively*. This practical resource offers a variety of engaging lessons and activities designed for everyday use in English language classrooms. Thornbury's (2007) aim is to stimulate students' imagination, humor, and overall creativity, ultimately enhancing the effectiveness of grammar practice. The book provides over 50 complete lessons covering a wide range of grammar structures, catering to diverse learner levels and age groups. Each lesson is structured with two main sections: Language Awareness Activities and Creative Grammar Practice (Thornbury, 2007). In addition, the study conducted by Maley and Peachey (2010) demonstrates well how creativity plays a central role in effective language learning. In this study, the researchers argue that the core of creativity lies in 'making something new' – a concept that can be readily applied to grammar instruction. One of the earliest frameworks for understanding creativity comes from Wallas (1926), who proposed a four-stage process: Preparation, Incubation, Illumination,

and Verification. In the context of grammar learning, the preparation stage involves immersing oneself in the target language structure (Sadler-Smith, 2015; Wallas, 1926).

The final aspect is practical thinking. Students implement, use, apply, and put into practice what they have learned in real-world scenarios (Sternberg, 2001). Teachers can design grammar instruction engaging students to real-world situations. For example, teachers lead student brainstorm preparations that are needed for a family reunion, considering logistics, communication, and potential problems that might require on-the-spot solutions (Sternberg, 2001). This activity integrates grammar skills with planning and problem-solving in a practical context. Role-play could also be helpful for this kind of thinking. Teachers can address students role-playing in handling everyday situations that require clear communication and grammatical accuracy, such as ordering food at a restaurant or resolving a misunderstanding (Sternberg, 2001). This practical application reinforces grammar in an interactive and relevant way. Despite limited research on applying Sternberg's Triarchic Theory (2001) to grammar instruction, particularly its emphasis on the Practical Thinking type, exploring this aspect in the classroom holds promise. While the Practical Thinking type deals with applying knowledge to future situations, its complexity makes it an area for preliminary exploration in this study. As such, we take a preliminary look at this aspect as part of the current study, examining the self-evaluation the participants revealed within the research. This initial exploration can serve as a foundation for future studies delving deeper into the application of Sternberg's Practical Thinking type in grammar teaching.

All in all, Sternberg's Triarchic Theory (2001) demonstrates the effectiveness of this approach. Effectively integrating thinking skills into grammar instruction requires considering factors like the topic, student needs, and language level. By designing engaging activities and promoting active learning, teachers can boost student motivation, enthusiasm, and most importantly, their critical thinking abilities alongside their grammatical competence. As Fisher (2008) argues, fostering thinking skills is at the heart of education, a sentiment echoed by Dewey (1966) who emphasized the development of 'ability to think' as a core educational objective. This study consequently investigates a promising approach to grammar instruction that can provide a strong foundation for EFL middle school learners.

2.5 Four-Stage Lesson Plan as a Framework for Effective Learning/Teaching

Lesson planning is a cornerstone of effective teaching. It provides a roadmap for educators, outlining learning objectives, teaching methods, and assessment strategies. While various lesson plan formats exist to suit diverse subjects, learning styles, and time constraints, their models share commonalities. Effective lesson planning is important for successful teaching. While specific lesson plan formats may vary, Wilson, (2021) assets that effective lesson plans need to contain three components. The primary one is Goals

and Objectives. This initial step defines the desired learning outcomes for the lesson. What specific knowledge, skills, or understanding should students acquire by the end? Clearly articulated objectives provide both teachers and students with a focused learning target. Another main component is Teaching Methods, where teachers choose the instructional strategies that will best facilitate student learning. This might involve lectures, discussions, group activities, demonstrations, or technology integration. The chosen methods should align with the learning objectives and cater to different learning styles. The final component is Assessment essential for gauging student comprehension and ensuring the lesson's effectiveness. Teachers utilize various assessment tools like quizzes, projects, observations, or discussions. This feedback loop allows educators to adjust instruction and personalize learning experiences.

To implement these components in actual practice, the concepts are spelled out to a more practice use. Sutawong (2018) suggests a four-stage learning cycle consisting of Do Now, Purpose, Work Mode, and Reflective Thinking. The first stage, Do Now, is opening activity which sets the stage for learning. It might involve a quick quiz, a thought-provoking question, or a problem-solving task related to the upcoming lesson. The goal is to activate prior knowledge and pique student interest. Then, Purpose, the second stage, explicitly outlines the learning objectives for the lesson. Students clearly understand what they are expected to learn and achieve by the end of the class period. In the third stage, Work Mode, students actively engage with the new material through teacher-led instruction, independent practice, or collaborative activities. This is where the core learning takes place. The final stage, Reflective Thinking, is very important in the sense that the lesson needs to conclude with a reflective component. Students might summarize key takeaways, answer questions, or discuss their learning experience. This fosters critical thinking and metacognition (thinking about thinking) (Sutawong, 2018).

While Sternberg's Triarchic Theory offers a valuable framework for understanding intelligence, its application in Southeast Asian classrooms, particularly in Thailand, appears limited. Most existing studies focus on the elementary level and subjects other than English. For instance, Poangpaiboon (1998) found that sixth graders exhibited improved thinking skills after implementing the theory. Similarly, Wiboonyodsarin (2000) reported significant enhancements in creative problem-solving and academic achievement among five elementary students when utilizing Sternberg's Triarchic Teaching Model in life experiences. Thammasaranyakun et al. (2012) investigated mathematical problem-solving using a combination of Sternberg's four-step model and the heuristic concept with sixth-graders. Students in the experimental group exhibited higher scores on a post-test compared to a pre-test. However, research on the effectiveness of the four-stage learning cycle specifically for grammar acquisition in lower secondary education appears scarce, although grammar instruction remains a cornerstone of most English as a Foreign Language

(EFL) programs (Ellis, 2006), This gap in knowledge presents a valuable opportunity to explore how the four-stage cycle, which typically involves activating prior knowledge, acquiring new information, applying the knowledge, and reflecting on learning (Helmich, 2001) could benefit lower secondary learners in their quest to master English grammar. Investigating its application in EFL grammar instruction, alongside the multifaceted approach offered by Sternberg's Triarchic Theory, could hold promise for promoting deeper understanding and long-term retention of grammatical concepts.

3. Research Methods

3.1 Research Context, and the Course

This study's research context was a leading Bangkok public school known for its academic excellence. The school serves students in grades 7 through 12, offering both a standard Thai national curriculum program and an English-medium Gifted Program. The specific course investigated was Basic English 5, a required grammar-focused course for second-semester Gifted Program students.

3.2 Participants

This study involved 21 ninth-grade students enrolled in Basic English 5 in 2021. Convenience sampling was employed to recruit willing participants whose learning records and classwork were analyzed to gain insights into their learning experiences (Creswell, 2014). All participants were identified as Gifted Program students with a cumulative GPA exceeding 3.0 on a 4.0 scale. To supplement the data obtained from regular class participation and questionnaire responses, seven female students volunteered for qualitative interviews, allowing for richer data and detailed perspectives (Merriam, 2009).

3.3 Research Approach

This study employed a one-group pretest-posttest quasi-experimental design with mixed methods analysis (Creswell, 2014). A control group was not included due to ethical considerations. Withholding potentially beneficial instruction, such as critical thinking emphasis, from a control group would be unethical (Shadish et al., 2002).

3.4 Data Sources

Triangulation was employed to gather data from multiple sources, strengthening the research's credibility (Jick, 2014). Quantitative data were collected through a pre-test and post-test using a thinking-skills test. Additionally, a questionnaire measuring student attitudes toward being taught thinking skills based on Sternberg's Triarchic Theory was administered (Sternberg, 1985). Qualitative data were obtained through two methods: student-created mind maps and semi-structured interviews.

3.5 Research Instruments

To obtain quantitative data, we employed three instruments for quantitative data collection: a thinking-skills test, a student attitude survey (toward thinking skills after the intervention), and a four-stage lesson plan (analyzed for its quantitative aspects).

3.5.1 Instruments for Quantitative Data

1) Thinking-Skills Test

This researcher-developed test measured students' knowledge and thinking abilities aligned with the Basic Education Core Curriculum B.E. 2551 (A.D. 2008) (Ministry of Education, Thailand, 2008). While the Ordinary National Educational Test (O-NET) from the National Institute of Educational Testing Service (2021) assesses overall academic proficiency, the current test specifically focused on thinking skills.

The test development process involved five steps. First, we developed thinking-skill-related questions from O-NET test papers from 2015 to 2018 (National Institute of Educational Testing Service, 2021), and the PISA 2018 test paper (Organisation for Economic Co-operation and Development (OECD), 2018), both standardized assessments for Grades 6, 9, and 12. Second, we also developed additional test items to complement the selected questions. Third, three applied linguistics experts with over 30 years of English teaching experience at a leading Bangkok public school assessed the test's content validity using the Index of Item-Objective Congruence (IOC) developed by Rovinelli and Hambleton (1977). Fourth, the test was revised based on the experts' feedback. Finally, the final IOC score was computed, where the IOC result of the Thinking-Skills Test was 0.9, indicated strong content validity.

To assess the participants' thinking skills, we employed a thinking rubric framework by Sternberg's Triarchic Theory of Intelligence (Sternberg, 1988). This rubric aligned with the theory's three components. First, the Analytical Thinking involves applying intelligence to compare and contrast information, analyze complex ideas, explain reasons for events, and identify problem causes. Second, the Creative Thinking emphasizes originality and divergent thinking, this component focuses on the ability to generate new ideas, imagine possibilities, and elaborate on concepts. Third, the Practical Thinking assesses how effectively learners can apply their knowledge and skills to solve real-world problems or complete tasks in a practical manner.

2) Researcher-Developed Questionnaire

We created a questionnaire to ask the students' attitudes toward learning English grammar through the three ways of thinking by the Sternberg's Triarchic Theory framework (Sternberg, 1996). The knowledge from literature review in relation to using this theory in enhancing students' thinking skills was mainly incorporated into the questionnaire

contents or questions. Following McLeish (2009), we created a three-section questionnaire, participants' background, their opinions toward teaching through the three-way of thinking, and suggestions for future use. The second section was the main one with a five-point rating scale design, used in eliciting students' opinion ranging from (strongly agree (5); agree (4); undecided (3); disagree (2); and strongly disagree (1) (DeVellis, 2017). The section drew the information on three ways of thinking. First, Critical-Analytic abilities are involved in analyzing, evaluating, critiquing, and comparing and contrasting things. Second, Creative abilities are involved in creating, exploring, discovering, inventing, imagining and supposing. Third, Practical abilities are involved in applying, using, implementing and putting into practice (Sternberg, 1999, pp. 438-439). After completion, the questionnaire was validated by the same three experts who also helped with the thinking skills text. Using the index of item-objective congruence (IOC) (Rovinelli & Hambleton, 1977) in validation process, the IOC result was 0.86, which met the standard of the instrument quality.

3) Student Attitude Questionnaire

To assess student attitudes towards learning English grammar through Sternberg's Triarchic Theory (Sternberg, 1996), a researcher-developed questionnaire was employed. Information from the literature review on using this theory to enhance thinking skills informed the questionnaire content.

The questionnaire, following McLeish (2009), consisted of three sections:

1. Participant Background: This section gathered basic information about the participants.

2. Opinions on Triarchic Thinking: This main section used a five-point Likert scale (strongly agree - strongly disagree) adapted from DeVellis (2017) to gauge student opinions on learning through Sternberg's (1996) three thinking types. The first type is a Critical-Analytic aspect, which includes important actions like analyzing, evaluating, critiquing, and comparing/contrasting. A Creative aspect is the second type that contains certain actions: creating, exploring, discovering, inventing, imagining, and supposing. The final type, a Practical one, involves related actions: applying, using, and implementing.

3. Suggestions for Future Use: This section invited students' suggestions for future application of this approach.

The questionnaire's validity was established using the Index of Item-Objective Congruence (IOC) (Rovinelli & Hambleton, 1977) by the same three experts who validated the thinking-skills test. An IOC score of 0.86 indicated good instrument quality.

4) Four-Stage Lesson Plan

This study employed a four-stage lesson plan framework adapted from Sutawong (2018). The plan consisted of four stages: Do Now, Purpose, Work Mode, and Reflective

Thinking. These stages were implemented over eight, one-and-a-half-hour learning sessions held on Fridays during the thinking-school club. Due to COVID-19 and student scheduling conflicts, the original eight sessions were condensed into five units focusing on specific verb tenses: present simple, present continuous, past simple, past simple vs. present perfect, and passive voice. Despite the adjusted schedule, all learning content was covered, with opportunities for after-class questions. The first and last sessions were mandatory and involved creating mind maps for present simple and passive voice, respectively. The remaining four sessions focused on specific thinking skills (critical-analytic, creative, and practical) aligned with Sternberg's Triarchic Theory (Sternberg, 1996). In each session, students worked in groups, selecting their preferred thinking style to complete the activities. Authentic materials, including exercises based on these materials, were incorporated into each lesson.

3.5.2 Instruments for Qualitative Data

1) Semi-Structured Interviews

Following the intervention, semi-structured interviews were conducted to gather in-depth information about student experiences (Merriam, 2009). This method allowed participants to respond freely and openly to a set of seven interview questions (Creswell, 2014). The questions built upon the student attitude questionnaire, providing an opportunity to express more nuanced opinions about the instructional methods and their preferences (Denzin & Lincoln, 2018). Adapted from Hoang (1995), who structured a framework for data organization and categorization from initial expectations to final evaluation, the interview questions explored the following:

1. Expectations for a thinking classroom: This question aimed to understand student perceptions of an ideal learning environment focused on developing thinking skills.
2. Preferred learning style: Understanding student preferences for learning English can inform instructional design (Oxford, 2011).
3. Preferred analytic thinking activities: This question focused on specific activities students enjoyed within the analytic thinking component.
4. Preferred creative thinking activities: Similarly, this question explored student preferences for activities related to creative thinking.
5. Preferred practical thinking activities: This question investigated student preferences for activities focused on practical application of learning.
6. Advantages and disadvantages of the three-way thinking approach: This question aimed to identify student perspectives on the strengths and weaknesses of the instructional approach based on Sternberg's Triarchic Theory (Sternberg, 1996).

7. Implementation challenges and opportunities: This question explored potential difficulties or favorable circumstances students anticipated related to implementing the new instructional methods.

The interview questions were validated by the same three experts who assisted with the development of the thinking-skills test and the student attitude questionnaire, ensuring content validity (Jick, 2014).

Since the participants were Thai, interviews were conducted in their native language. To ensure accurate analysis, we employed thematic analysis (Braun & Clarke, 2006) on the original Thai transcripts. Thematic analysis of excerpts can enable a clear articulation of the expectations, benefits, and challenges associated with the new grammar instruction method, offering a comprehensive understanding of its impact on student learning and engagement. Following analysis, key excerpts were translated into English for inclusion in the findings. To preserve participant meaning, we maintained the original organization of the interview content. Our analysis focused primarily on extracting the intended meaning from the participants' responses.

3.5.3 Teaching and Research Procedure

This section outlines the research process, which involved five key stages, as presented in Table 3.1.

Table 1

Five-stage teaching and research procedure

Stages	Descriptions
1. Pre-test	Students participated in a pre-test to assess their baseline thinking skills using a researcher-developed thinking-skills test (see Instruments for Quantitative Data section).
2. Intervention	Students participated in eight, 180-minute instructional sessions focused on developing thinking skills through English grammar instruction aligned with Sternberg's Triarchic Theory (Sternberg, 1996) (see Four-Stage Lesson Plan section).
3. Post-test	A post-test using the same thinking-skills test was administered to assess any changes in students' thinking skills after the intervention.

Table 1

Five-stage teaching and research procedure (Cont.)

Stages	Descriptions
4. Questionnaire Administration	Following the post-test, students completed a questionnaire to gauge their attitudes towards learning English grammar through the three thinking styles (see Student Attitude Questionnaire section).
5. Online Interviews	Semi-structured online interviews were conducted with a subset of participants to gather in-depth information about their experiences with the instructional methods (see Semi-Structured Interviews section).

3.6 Data Analysis

This study employed a mixed methods approach, utilizing both quantitative and qualitative data analysis techniques (Creswell, 2014).

3.6.1 Quantitative Data Analysis

Statistical Package for the Social Sciences (SPSS) software was used to perform descriptive statistics, including calculating percentages, means, and standard deviations. Additionally, dependent t-tests were conducted to analyze pre-test and post-test scores on the thinking-skills test, assessing potential intervention effects (Field, 2013).

3.6.2 Qualitative Data Analysis

Thematic analysis (Braun & Clarke, 2006) was employed to analyze data from the semi-structured interviews and the student responses of open-ended questionnaires (Creswell, 2014). This process involved coding the data based on relevant themes and categories to identify patterns and insights related to student experiences with the instructional methods (Elo & Kyngäs, 2008). The analysis focused particularly on aspects of student behavior that reflected the development of thinking skills during group work activities.

4. Findings and Discussion

This section is outlined by the two research questions explored.

4.1 Finding of Research Question One

To what extend do students improve their grammar learning after participating in the English grammar instruction informed by the Triarchic Theory?

In this Research Question, we assessed student learning in intermediate English grammar through a researcher-created thinking skills test administered as both a pre-test and a post-test. To measure the impact of the instruction, we compared the mean scores of the pre-test and post-test results, presented in Tables 4.1 and 4.2.

Table 2

Comparison of pre-test and post-test scores with independent samples t-test

	N	Mean ($\bar{x}$)	*SD*	t	Sig.
Pre-test	21	12.05	3.81	-3.18	.008*
Post-test	21	15.10	5.22		

* $p < .05$, one tail test

Table 2 shows a statistically significant improvement in posttest scores compared to pretest scores ($p < .05$). This suggests that the Triarchic Theory integrated within the four-stage lesson plan effectively facilitated the participants' grammar learning.

To delve deeper into which thinking skills showed the most improvement, we analyzed the data for each of the three thinking modes (Analytical, Creative, and Practical) proposed by the Triarchic Theory. We employed t-tests to compare the pre- and post-test scores within each type, and the results are presented in Table 4.2.

Table 3

Comparison of pre-test and post-test scores classified by thinking type

Ways of Thinking	Total Scores	Pre-test		Post-test		t	Sig.
		$\bar{x}$	*SD*	$\bar{x}$	*SD*		
Analytic Thinking	10	4.09	1.95	5.71	2.17	-3.60	.002
Creative Thinking	10	3.19	1.75	3.85	1.31	-1.73	.100
Practical Thinking	10	4.76	1.76	5.52	2.69	-1.25	.225

* $p < .05$, one tail test

The analysis revealed a significant improvement in Critical- Analytical thinking scores between the pre-test and post-test ($p < .05$), as shown in Table 4.2. However, there were no statistically significant differences in the mean scores for Creative Thinking and Practical Thinking between the two tests.

The lack of significant improvement in Creative and Practical Thinking skills may be due to several factors. First, Critical-Analytical thinking skills are often emphasized in traditional classroom activities and assessments, including language and grammar instruction and tests. Creative Thinking, on the other hand, might be more complex and require different assessment methods beyond standardized tests. Finally, Practical Thinking focuses on long-term application of knowledge, and students may not yet be aware of how the learned concepts will benefit them in the future. This lack of awareness could make it difficult for them to accurately self-assess their progress in these areas.

The study suggests that participants primarily associated their learning with the Critical-Analytical Thinking aspect of the Triarchic Theory. This emphasis can be attributed to the inherent nature of analytical thinking itself. According to Sternberg (2001), this type of thinking encourages students to make judgments, evaluate critical points in learning materials, compare and contrast ideas, and critique questionable information. Grammar teachers who understand the importance of thinking skills naturally integrate these aspects into their instruction (Thornbury, 2007). Through such integration, students are guided to conceptualize key points by applying Critical-Analytical Thinking, ultimately achieving desired learning objectives (Sternberg, 2001).

While limited to grammar instruction, these findings support previous research advocating for the simultaneous development of student thinking and language skills, as seen in Alidmat and Ayassrah's study (2017). Furthermore, considering the emphasis on thinking skills in Thailand's Ordinary National Educational Test (O-NET) administered by the National Institute of Educational Testing Service (2020), we are certain that participants could be well-prepared for such assessments. With continued practice, they may further develop their ability to hold both strong language knowledge and critical thinking skills

However, we realized that the participants may need more training in terms of the Creative and Practical Thinking types. This study highlights the need for further exploration in developing Creative and Practical Thinking skills alongside the Analytical Thinking skills addressed here. This finding can inform educators and future researchers about the importance of incorporating a wider range of thinking skills into instruction to enhance overall student development.

4.2 Finding of Research Question Two

What are students' attitudes towards learning English grammar informed by the Triarchic Theory?

The key finding of this research question is presented in Table 4.3.

Table 4

Participants' attitudes toward Critical-Analytical Thinking Skills

Questionnaire items	Mean	*SD*	Interpreted meaning
1. I willingly participate in analytic-thinking activities / assignments.	4.19	.634	Somewhat positive
2. I prefer that my teachers use more group activities / assignments whilst practicing analytic-thinking skill.	4.42	.504	Highly positive
3. Analytic-thinking activities / assignments help me to: have the abilities to compare and contrast; analyze; evaluate; critique; ask why; explain why; explain causes; and evaluate assumptions more.	3.96	.774	Somewhat positive
4. Analytic-thinking activities / assignments enhances good working relationships among students.	3.88	.711	Somewhat positive
5. I feel more confident, dare to think, think about everything rationally, and become a good thinker.	3.96	.774	Somewhat positive
Grand mean	4.08	.679	Somewhat positive

N=21

Criteria for interpretation

1.00-1.80: strongly negative

1.81-2.60: negative

2.61-3.40: neutral

3.41-4.20: somewhat positive

4.21-5.00: highly positive

The researcher-designed questionnaire used a 5-point Likert scale (see Table 4.3 for interpretation). The overall mean score (4.08) indicates that participants had somewhat positive attitudes towards the four-stage lesson plan designed to promote thinking skills based on the Triarchic Theory (Sternberg, 1996).

Delving deeper into specific questionnaire items, we found that participants held particularly positive attitudes when teachers incorporated more group activities during Critical-Analytical Thinking skill development (mean = 4.42). This positive perception is further supported by interview data. Participants expressed a deeper understanding of

their critical and analytical thinking skills thanks to the program. For instance, Student 1 referred to the class as a “thinking classroom,” while Student 5 described applying these skills to craft emails for coursework and even her YouTube content creation.

> *I was able to think more analytically. I expect something that is not in the frame because everyday life and life in the classroom are not the same. When we go outside the class, sometimes we can’t think of it. So this class is thinking classroom. It is not just learning grammar.* (Student 1’s interview data)

> *One activity that I like and I have applied it in real life is formal and informal letter writing where the teacher let students analyze the pattern of the letter and try to write the informal letter. I have actually used it. Even if the world has changed, the style of writing a letter is still the same. I have my own Youtube channel and I wrote an e-mail to request the copyright of the song. And the record label responded to me, granting permission to use that song. Their email was written in the same format that had been taught in the classroom.* (Student 5’s interview data)

For the remaining questionnaire items, the participants reported somewhat positive attitudes. These included participation in Analytical thinking activities/ assignments (mean = 4.19), the perceived benefit of activities enhancing their abilities and confidence in Critical-Analytical Thinking skills (both means = 3.96), and the positive aspects of group work (mean = 3.88). One student’s open-ended response exemplifies this: “I like the thinking activities in groups in the room that we help each other to analyze and answer questions and get the points. That was so exciting and really fun." This suggests that collaborative learning could be a valuable element for teachers to consider when fostering Critical-Analytical thinking skills in the classroom.

Then, the data in Table 4.4 reveal the participants’ attitudes toward Creative Thinking type.

Table 5

Participants' attitude toward Creative Thinking Skills

Questionnaire items	Mean	*SD*	Interpreted meaning
1. I willingly participate in creative activities/ assignments.	4.42	.504	Highly positive
2. I prefer that my teachers use more group activities / assignments whilst practicing creative skill.	4.45	.766	Highly positive
3. Creative-thinking activities / assignments help me to: have the abilities to create; invent; imagine; design; show how; suppose, and say what would happen if… more.	4.28	.634	Highly positive
4. Creative-thinking activities / assignments enhances good working relationships among students.	4.19	.857	Somewhat positive
5. I feel more confident, dare to think, think about everything rationally, and become a good thinker.	3.97	.513	Somewhat positive
Grand mean	4.26	.654	Highly positive

N=21

Criteria for interpretation

1.00-1.80: strongly negative

1.81-2.60: negative

2.61-3.40: neutral

3.41-4.20: somewhat positive

4.21-5.00: highly positive

The participants demonstrated the most positive attitudes towards the Creative Thinking type (overall mean = 4.26). Similarly, their responses indicated highly positive views on participating in Creative Thinking activities (mean = 4.42), teachers incorporating group activities (mean = 4.45), and the perceived benefits gained from these activities (mean = 4.28). Attitudes towards fostering good relationships and confidence in creative thinking through the activities were somewhat positive (means = 4.19 and 3.97, respectively). A potential factor influencing these responses could be the teacher's openness as a teaching style, as exemplified by Student 1's opinion.

> *Creative thinking activities are something my friends and I like the most because the teacher is open to students to think outside the box e.g. informal letter writing in group. One of my friends' group wrote to Doraemon. We thought free, unlike learning in the normal system. The activity makes us know that our brain is the best. It can think something unbelievable. And I would like to know that how far we can go. (*Student 1' s interview data)

Student 1's comment exemplifies the value of teachers encouraging students to "think outside the box." This approach aligns with Maley and Peachey's (2010) finding that creativity plays a crucial role in language learning activities, particularly when students are challenged to "make something new." Creative learning environments can potentially boost student motivation for the subject matter and even foster self-directed learning in the future.

Table 6

Participants' attitude toward Practical Thinking Skills

Questionnaire items	Mean	S.D.	Interpreted meaning
1. I willingly participate in practical activities / assignments.	3.68	1.137	Somewhat positive
2. I prefer that my teachers use more group activities / assignments whilst practicing practical skill.	4.10	.831	Somewhat positive
3. Practical-thinking activities / assignments help me to: apply; show how we can use something; implement; utilize; and demonstrate how in the real world more.	4.03	.752	Somewhat positive
4. Practical-thinking activities / assignments enhances good working relationships among students.	3.88	.711	Somewhat positive

Table 6

Participants' attitude toward Practical Thinking Skills (Cont.)

Questionnaire items	Mean	*SD*	Interpreted meaning
5. I feel more confident, dare to think, think about everything rationally, and become a good thinker.	3.87	.846	Somewhat positive
Grand mean	3.91	.855	Somewhat positive

N=21

Criteria for interpretation

1.00-1.80: strongly negative

1.81-2.60: negative

2.61-3.40: neutral

3.41-4.20: somewhat positive

4.21-5.00: highly positive

The data suggests somewhat positive attitudes towards Practical Thinking (grand mean = 3.91). This trend is consistent across all individual questionnaire items. The participants expressed a moderate preference for group work in this context (mean = 4.10), along with seeing the value of applying learned knowledge to new situations (mean = 4.03). Their responses indicated a somewhat positive perception of improved work relationships (mean = 3.88) and increased confidence in approaching future situations (mean = 3.87). However, their willingness to actively participate in these activities was the least positive aspect (mean = 3.68).

Among the three thinking skills, participants exhibited the most positive attitudes towards activities promoting Creative Thinking (grand mean = 4.26). Their attitudes towards the other two types, Critical-Analytical Thinking (grand mean = 4.08) and Practical Thinking (grand mean = 3.91), were somewhat positive.

These self-reported attitudes aligned with the Thinking Skills Test results from Research Question 1. The consistency between findings from both Research Questions suggests the data more strongly supports the development of Critical-Analytical thinking skills. This makes sense, as participants likely received prior training in critical-analytical thinking through various courses, not just English language classes.

An intriguing aspect of the data is the participants' comparatively lower positive attitudes towards Practical Thinking. While still somewhat positive, this finding is reasonable. Since Practical Thinking involves applying learned knowledge to future

situations, participants might find it difficult to gauge its applicability. Student 2, for example, expressed that the application of knowledge might be limited by the specific context (areas of implication). Their current learning might seem more relevant to academic settings than everyday life.

> *Practicing practical thinking could be ok but it was hard for practice. We applied what we learned and used it in daily life. We can think faster or speaking to foreigners faster. However, it is too academic and it is in a bit rut. We put a little pressure on being academic.* (Student 2' s interview)

However, the participants generally held positive views towards the grammar instruction based on Triarchic Theory. This approach fostered increased class engagement, with students like Student 3 demonstrating greater confidence in actively participating. Interestingly, collaborative work provided students with diverse perspectives, as highlighted by Student 8. Furthermore, the instruction potentially enhanced affective learning, evident in Student 12's enjoyment of grammar comprehension.

> *Thinking skill activities help promote students dare to think, dare to do, and dare to speak more English because teacher encourages you to think all the time.* (Student 3's interview data)

> *In a thinking classroom, you exchange ideas and knowledge with friends, and you need to brainstorm together. This process leads to a more diverse range of ideas than you could generate on your own.* (Student 8's interview data)

> *Thinking activities while learning grammar are fun because they are integrated into the teaching process, making it not boring, engaging and very understandable. Moreover, it makes us understand how to use English grammar better which has been adjusted to suit the situation.* (Student 12's interview data)

The interview data revealed three key insights for teaching methods. The first involves incorporating self-evaluation into classroom activities. Student 4, for example, suggested a friendly approach where students are encouraged to identify areas for improvement through self-evaluation. This process fosters self-assessment, a crucial element for student learning.

> *I suggested that before the beginning of the lesson, teacher and all students come and talk to each other friendly, no pressure. Let everyone analyze their own areas for improvement, not as flaws, but as opportunities to develop weaknesses. Classes or teachers will integrate these activities into the course. Students will recognize their own shortcomings and develop along with the teacher.* (Student 4's interview data)

Student interviews also highlighted the value of an integrative teaching approach. The participants advocated for incorporating grammar instruction into other language skills, such as listening, speaking, reading, and writing. This suggests a move away from isolated grammar lessons and towards a more integrated approach that participants believe would be more beneficial. The interview data below demonstrate their opinion:

> *I would like to communicate between teachers and students. It doesn't have to be strictly about grammar or verbal skills; just saying it. It should be practical and applicable to real-life situations.* (Student 3's interview data)

> *I want to practice all English skills: listening, speaking, reading and writing in the class.* (Student 4's interview data)

This view aligns with Thornbury's (2007) emphasis on more creative grammar instruction that enhances learner awareness of the language. This could involve an inductive approach, where grammar rules and other skills act as supportive scaffolding. Learners can then grasp the language and develop other skills simultaneously.

The student interviews also revealed a desired change in both teaching methods and assessment approaches. The participants, like Student 5, expressed concern that current evaluation methods might not reflect how they are taught. While Student 5 enjoyed the class activities, they found the exams lacking in connection to the thinking skills developed in class. This suggests a potential need to move away from traditional exams and explore alternative assessment methods.

> *In fact, there are many advantages, but the only disadvantage is the current education system, whether in schools or other institutions. Although in the thinking classroom, teachers are open-minded, when taking exam at school, it returns to the original system. As a result, when teachers do not create the exams alone, students are often required to sit and memorize tenses, which are used very little in daily life. It is therefore quite difficult to change all of the school systems. Not all systems can be replaced. If there is the cooperation between many parties, it will be very good.* (Student 5's interview data)

While the present study did not directly address assessment, the positive impact of the thinking classroom on grammar instruction highlights the potential for a more holistic approach to learning evaluation. Future research should explore how to integrate thinking skills into assessment practices.

This study suggests that integrating Critical-Analytical Thinking Skills into lessons can lead to very positive learning outcomes. This reinforces the importance of incorporating this type of thinking in English-related courses. Including learning tasks that reflect real-world practices, such as the problem-based approach used by Chiou (2019), can strengthen students' grammatical knowledge and prepare them to solve real-world challenges in their future careers, echoing the experiences of participants in Chiou's study.

However, the findings also suggest that further exploration is needed to develop methods for enhancing students' Creative and Practical Thinking Skills within lesson plans. Focusing on these areas in future research has the potential to yield even more positive results

Conclusion

This study explored the effectiveness of integrating Sternberg's Triarchic Theory of Intelligence (Sternberg, 1985) into an English grammar curriculum for a group of 21 ninth-graders enrolled in Basic English 5 at a prominent public school in Bangkok, Thailand. The data collection took place in 2021. The findings indicate that a four-stage lesson plan promoting these thinking skills can successfully enhance student learning in English grammar. Participants highlighted Critical-Analytical Thinking as particularly beneficial to their learning, expressing highly positive attitudes towards it. They also viewed Creative and Practical Thinking positively, although to a lesser extent. The study revealed that students found the activities enjoyable and motivating. Group work fostered a sense of comfort and reduced anxiety, encouraging them to share ideas and collaborate.

Additionally, internet research exposed them to a rich English environment, encouraging them to read, write, and critically evaluate information in English. This immersive experience contributed to improvements in not just thinking skills but also their overall English grammar, reading, and writing abilities. The study aligns with the growing body of research emphasizing the importance of integrating thinking skills into language learning activities (Chiou, 2019; Thornbury, 2007). By incorporating aspects of Sternberg's Triarchic Theory, teachers can create engaging and effective learning experiences that cater to diverse student needs and promote holistic language development.

The integration of Sternberg's Triarchic Theory into English grammar instruction offers a promising approach for Thai EFL classrooms. By incorporating analytical, creative, and practical activities into the curriculum, teachers can enhance students' thinking skills. This entails designing lessons that integrate error analysis, creative writing, and real-world language use. Assessments should holistically evaluate both grammatical proficiency and cognitive growth, providing ongoing feedback. To successfully implement this approach, teachers require training and adequate resources. Fostering an interactive and supportive classroom environment is crucial for engaging students, motivating them to apply grammar creatively and practically, and ultimately enhancing their overall learning experience.

However, we acknowledge some limitations. Firstly, data collection took place outside regular class hours due to school scheduling limitations. Future studies could benefit from conducting the research during regular class time. Secondly, the thinking skills test relied on content from the past four years of O-NET (National Institute of Educational Testing Service, 2021) and PISA tests (OECD, 2018). While the content quantity may be adequate, using tests spanning a decade or more raises concerns about content trends and test validity. Future researchers are encouraged to consider the test content history within a longer timeframe to ensure a more reliable test set.

Despite these limitations, the findings serve as a springboard for further research. Teachers of secondary schools can utilize these findings to explore incorporating thinking skills into their language learning curricula. Additionally, these results can guide further investigations into grammar instruction that combines diverse perspectives to enhance Thai EFL learners' language abilities and thinking skills, which are ultimately valuable assets for higher education and future careers.

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