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Critical Reading and Engagement Matters: Integrating the Flipped 5E Inquiry Instruction with Socratic Seminars

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Abstract

Despite the breadth of research on EFL reading comprehension, limited attention has been given to teacher support for critical reading and learner engagement in the Thai higher education context. This study applied Barrette's taxonomy as its analytical framework to explore whether tertiary students' critical reading and engagement can be enhanced through an innovative blend of 5E inquiry-based instruction and Socratic seminars in a flipped classroom. The research employed a quasi-experimental one-group pretest-post-test design, focusing on 33 second-year English students, whose placement test results identified them as having low critical reading skills. The instruments used included 12-week lesson plans, critical reading pre- and post-tests, and self-reflective questionnaires. The findings demonstrated significant improvements in the participants' critical reading comprehension, achieving a p -value of 0.001 at the 0.05 significance level ($t = 8.586$). During the reading activities, the students exhibited a moderate level of engagement in both the affective domain ($M = 3.85$, $SD = 0.716$) and the cognitive domain ($M = 3.71$, $SD = 0.773$). In addition, they demonstrated a high level of engagement in the behavioural domain ($M = 4.35$, $SD = 0.651$). These results contribute to the academic discourse concerning effective English teaching methodologies and offer practical implications for related EFL contexts. The study concludes with a discussion of its limitations and recommendations for future research, emphasizing the need for broader application and validation of these instructional strategies across diverse EFL learning environments.

Keywords: 5E inquiry-based learning, critical reading and engagement, flipped classroom, literacy skills, Socratic seminars.

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1. INTRODUCTION

The national core curriculum of Thailand emphasizes key areas of language competency, categorized into reading, literature, writing, listening, speaking, and grammar (Thanavanitchayakul & Srichok, 2024). Under the revised core curriculum introduced in 2017, English became a compulsory subject for all Thai students at every educational level (The Office of Higher Education Commission, 2018). This initiative aims to promote 21st-century skills, including literacy and effective communication, alongside critical thinking. Skills in reading English remain essential for English as a Foreign Language (EFL) students (Muhassin et al., 2021; Nasri & Biria, 2017). Higher education students are expected to critically analyse their reading materials and articulate their beliefs regarding content, requiring them to cultivate Higher-Order Thinking Skills (HOTS).

Regretfully, many Thai students currently fail to acquire these crucial skills. The traditional method of instruction (which emphasizes memorization and grammar-translation instruction) is ineffective in encouraging students to engage with English texts and think critically (Chinpakdee & Gu, 2024). This shortcoming of the current instructional methods was demonstrated by the results released by the Organization for Economic Co-operation and Development (OECD) for the 2022 Program for International Student Assessment (PISA). PISA evaluated the academic performance of 15-year-old students in reading, science, and mathematics across more than 81 countries in 2022. The results revealed significant deficiencies in reading literacy and critical reading skills among Thai students, showing that only 35 percent of 15-year-olds met the baseline reading level, in contrast to 74 percent across OECD countries. As a result, Thailand ranked among the lowest globally, coming in at 57th out of 81 economies and countries in terms of average reading scores (OECD, 2023). The PISA report revealed that Thai students are compromised by shortcomings in their analytical and critical thinking, alongside their comprehension skills related to English texts.

Yet, previous situations have revealed that the current English teaching and learning practices in Thailand have proved generally ineffective, which causes significant barriers to both English language proficiency and the cultivation of critical thinking skills (Teng & Sinwongsuwat, 2015). However, an effective critical reading practice for EFL students, especially those in Thailand, involves defining cognitive and psychological characteristics. Most Thai EFL students are reluctant to read in English, primarily because they are not interested in the content due to its difficulty level, unfamiliarity, or irrelevance (Apairach, 2023). Therefore, a motivated and supportive educational setting is needed for students to increase their engagement and attentiveness (Taboada et al., 2013). It can thus be extracted that these problems stem from traditional teaching philosophies, which aggravate the issues by producing a non-engaging, passive learning culture in the reading classroom (Zhu et al., 2023).

To overcome the difficulties in the cognitive and psychological learning processes related to critical reading teaching, integrating the contemporary teaching methods, including the learning cycle, 5E and Socratic seminars have proven to be helpful (Acim, 2018; Kusmaryani, 2017). These procedures help organize a lesson and improve the general understanding of a passage, while also developing critical thinking skills. Based on Piaget's constructivist theory of human development, these approaches involve the student in the learning process as they independently interact with the material, with the teacher as the guide. This constructivist-based instruction leads to students being more responsible for their learning outcomes. It assists in the discovery process and the development of one's ideas while at the same time developing student interaction through organized discussions (Cobb, 2024; Jiang et al., 2023; Pelech, 2010; Richardson, 2005). In addition, to mitigate stress and improve students' readiness, the flipped technology has entered a promising potential (Hsieh et al., 2017). This model helps students prepare for class through instructional videos and assignments, enabling them to become more than just passive listeners and doers, but also active participants (Dong, 2016). It facilitates the development of terms used in class, the grasp of ideas discussed during the lesson, and the basic skills learned out of class for engagement in discussions, dramas, and problem-solving (G. Lee & Wallace, 2018).

Flipped classrooms with the 5E and the Socratic approach promote adult learning and raise critical thinking standards. This strategy of student engagement enhances understanding by engaging students before class through digital tools and also leads to better thinking due to preparation (Smith et al., 2018). However, earlier studies (Cahya & Katemba, 2023; Castrillón, 2020; Sittirach & Sroinam, 2022; Wheatley, 2018) have explored the following approaches in prior schemes: the 5E inquiry model, Socratic seminar, and the flipped classroom to improve students' critical reading. To a certain extent, some of the previous studies used the aforementioned instructional approach together with other pedagogy; however, no literature addressed the research of how the three teaching approaches of the 5E inquiry model, Socratic seminar, and the flipped classroom can be implemented to enhance students' critical reading comprehension and promote reading engagement. Further, the majority of the studies have been conducted among high school EFL students, while there is a limited research interest in the low proficiency of Thai tertiary students. Therefore, this current study explores Thai EFL tertiary students' critical reading of English texts, while also examining its potential to enhance engagement in reading. It addresses key concerns in English language education, such as improving reading comprehension, fostering critical thinking, and overcoming psychological barriers to learning. The two research questions are formulated as follows:

1. To what extent does the flipped 5E inquiry-based learning model combined with Socratic seminars enhance critical reading comprehension?
2. What reading engagement do students exhibit after being instructed with the flipped 5E inquiry-based learning model combined with Socratic seminars?

The first research question sought to determine any significant difference between the critical reading comprehension scores on the pretest and post-test. This analysis helped to formulate the hypotheses and the resulting findings, as presented below:

- Research Hypothesis 1 (H_1): The flipped 5E inquiry-based learning combined with the Socratic seminar can significantly enhance Thai tertiary students' critical reading comprehension.
- Null Hypothesis (H_0): The flipped 5E inquiry-based learning combined with Socratic seminar does not significantly enhance Thai tertiary students' critical reading comprehension.

The findings are expected to offer significant implications for improving the effectiveness of English teaching practices. They may help EFL educators design more relevant instructional materials and develop more engaging curricula suited to learners' needs. Finally, these results could play an important role in advancing English education and strengthening students' literacy skills.

2. LITERATURE REVIEW

2.1 Barrett Taxonomy and Reading Comprehension Levels

Rudd and Honkiss (2020) highlighted reading as a complex activity transforming written symbols into meaningful insights, promoting critical thinking and cultural awareness, with a significant influence on understanding and cognitive development. Bloom's Taxonomy and Barrett's Taxonomy are two interesting frameworks of analysis of reading comprehension. To begin with, Bloom's Taxonomy is flexible in that it focuses on a wide array of cognitive abilities, from simple remembering to thinking skills, and thus can be used in a number of subjects (Marzano & Kendall, 2007). Secondly, Barrett Taxonomy (created especially to cover the topic of reading comprehension) offers an understandable sequence of comprehension levels: 1) literal understanding, 2) reorganization, 3) inference, 4) evaluation, and 5) appreciation. To begin with, literal recall is concerned with remembering and understanding the textual information. This can be improved with specific questions that prompt students to find out specific facts. Secondly, reorganization is a process of bringing ideas together or bridging them in the text to trigger more interest. Thirdly, inferential comprehension involves the ability of the students to use their personal experiences to interpret what the text means, in addition to its literal meaning. Fourthly,

evaluation takes place when students critically assess the text based on established criteria, distinguishing between fact and opinion. Finally, appreciation engages students emotionally and aesthetically with the text, including recognizing literary elements and responding to the author's style (Krisnadayanti & Zainil, 2021).

This present research adopted Barrett's Taxonomy to examine students' reading abilities at three higher-order comprehension levels (i.e., inference, evaluation, and appreciation), focusing specifically on critical reading proficiency. The researchers therefore analysed students' responses to different question types, aiming to deepen the critical understanding of their comprehension. By utilizing Barrett's Taxonomy as an evaluative lens, this study seeks to generate detailed insights into the development of students' higher-order reading skills, thereby informing future pedagogical practices in EFL contexts.

2.2 Critical Reading and Its Instructional Practice in the Thai EFL Classroom

Critical reading can be considered a higher-order reading skill since it requires the learner to assess arguments and develop thoughtful responses to the information provided, thus demanding the capacity to interpret and analyse texts to draw inferences and conclusions (Astleitner, 2002). Various cognitive processes are necessary to perform critical reading, enabling the learner to develop a stronger sense of motivation and purpose while promoting greater receptiveness to different ideas (Al Roomy, 2022). From the teacher's perspective, carefully targeted approaches are necessary to develop learner comprehension. In Thailand, however, educators tend to show a preference for the traditional grammar-translation approach, in which the teacher is the primary focus of the class, translating the text for the learners, sentence by sentence (Chomchaiya & Dunworth, 2008; Euanorasetr & Suwanarak, 2023). These instructional practices lead to a classroom environment that promotes passive learning, where learners fail to fully engage with the texts through critical analysis, instead relying on the teacher's explanations. As a consequence, they tend not to develop the skills required for critical reading. They rarely evaluate arguments, challenge assumptions, or move beyond the literal meaning of the reading passage to form their connections (Sawangsamutchai & Rattanaich, 2016).

Thailand is known for EFL classrooms in which the rote memorization of grammatical rules is prioritized, along with the rote learning of vocabulary, while the interpretation of texts to understand the deeper meanings is usually ignored (Boonmoh & Tuaynak, 2023; Wutthisingchai & Stopps, 2018). This lack of critical engagement with written material leads to weaknesses in students' ability to ascertain what is fact and what is merely opinion, and how the tone of a writer conveys a message (Bowen et al., 1985; Kaur, 2013). However, the introduction of more recent and innovative teaching approaches, such as the 5E inquiry cycle, Socratic seminars, and the flipped classroom, would promote critical reading skills through a more active environment that utilizes inquiry-based techniques.

The 5E model comprises the notions of Engage, Explore, Explain, Elaborate, and Evaluate, and supports learners in reading critically by enhancing their analytical skills and promoting independent text exploration. During Socratic seminars, the discussion of ideas and arguments is done in an open-ended way, and this enables learners to participate in the critical process of reading materials. Thai students in the EFL classroom do not speak English as natives, and thus, they have difficulties in reading, particularly in the case of a high classroom workload. This issue can be addressed with the flipped classroom method implementation, as it enables learners to read at home, digest the information independently, and then discuss and analyse it in the classroom. By integrating the 5E model, Socratic seminar, and the flipped classroom approach, one can cease to rely on the use of traditional methods in the Thai EFL classroom and instead use innovative ones that can allow the development of active learning and critical thinking, as well as encourage the learners to read (Sawangsamutchai & Rattanaich, 2016).

2.3 Reading Engagement

Reading engagement has three major components, namely the cognitive, behavioural, and emotional (or affective) aspects. All these elements are related to the profound engagement of a reader in a reading task (Guthrie & Wigfield, 2000). Cognitive engagement refers to a reader's motivation and the application of metacognitive strategies, such as comprehension monitoring and self-questioning, which facilitate more efficient reading and deeper understanding of the text (Y. Lee et al., 2021). Behavioural engagement takes into account the time spent reading, the frequency of reading activity, and the interaction levels that occur when reading, whether in the classroom or independently. Consideration of these factors allows the engagement level of a reader to be evaluated (Y. Lee et al., 2021). Emotional engagement is related to opinions, perceptions, and emotions that the readers develop as they engage with a text (Kucirkova, 2019). When the feelings are positive, learners become more strongly motivated to read and are more willing to think critically about a text, thereby enhancing their comprehension of its deeper meaning (Guthrie & Wigfield, 2000).

Earlier research has examined the issue of reading engagement involving inquiry-based teaching interventions in several different scenarios. Wheatley (2018) reported enhanced learner engagement and performance after just two days of teaching focusing on inquiry-based learning, when measured through engagement ratings and post-survey evaluations. Smallhorn et al. (2015) also found improvements in engagement resulting from an inquiry-based approach, with improvements also recorded for critical thinking and analytical skills. Engagement can also be significantly improved through the use of online instructional technology. In South Africa, Chakawodza et al. (2025) examined the effects of the flipped classroom upon grade 12 chemistry students in a study based on engagement theory. It was found that the approach boosted engagement even in the face of the COVID-19 pandemic. However, the findings in such studies might not be directly applicable in the context of Thai EFL university students whose English proficiency may be much lower. It is apparent, therefore, that a gap exists in the literature since few researchers have sought to integrate the 5E model, Socratic seminars, and the flipped classroom in this particular Thai context to evaluate engagement.

2.4 The Integrated Instructional Model of the 5E Inquiry-Based Learning, Socratic Seminars, and Flipped Learning

There are five separate stages in the 5E inquiry learning model (Bybee & Landes, 1990): (1) engage, (2) explore, (3) explain, (4) elaborate, and (5) evaluate. Active learning is emphasized by the model, allowing learners to become more deeply involved in their learning (Ong et al., 2020). The 'engagement' stage sparks an interest in learning and evaluates existing knowledge, while the 'exploration' stage promotes hands-on discovery. The teacher is directly involved in the 'explanation' stage, performing the role of presenting key information and concepts. In addition, the 'elaboration' stage allows for the application of newly acquired knowledge through social interaction or idea exchanging, and the 'evaluation' stage entails the teacher assessing and gathering information about the performance of students through formative and/or summative assessments (Ting et al., 2021). Benefits of the application of the 5E model on inquiry-based instruction are documented in the literature of language education, where the use of the 5E model is evident in the need to enhance competence in reading English. To illustrate, Castrillón (2020) and Tarawneh (2024) also agreed to report the results that demonstrate that the use of the 5E model positively impacted the reading comprehension of students and their attitude to English among the 9th-grade EFL students. In addition, the mixed-method study by Ermawati et al. (2018) involved 40 respondents (students of English Education) as control and experimental groups to be instructed using the 5E model. In particular, the research found that the gains were in reading comprehension, working with challenging texts, prior knowledge activation, and collaborative learning. These results highlight one of the key contributions of the 5E model: enhancing learners' reading comprehension and appreciation of literature.

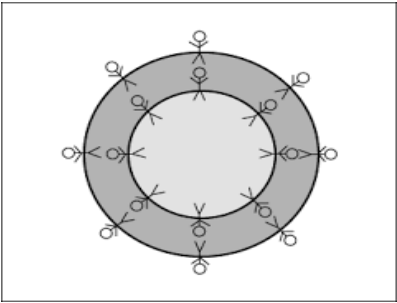
Within the frames of critical thinking and language classrooms, Socratic Seminar, as defined by [Castellanos-Reyes \(2021\)](#), is an instructional exchange that includes a discussion during which questions are asked to receive meaningful responses to them by students. This approach not only initiates an intellectual debate among parties that have varying views to pursue the truth. Socratic seminars in language classrooms encourage high-order thinking and enhance text comprehension. Instead of debating or sharing personal opinions, students are encouraged to work in small groups to ensure they have a logical understanding of the chosen reading text ([Castellanos-Reyes, 2021](#)). [Acim \(2018\)](#) researched Moroccan EFL instruction and concluded that critical thinking and questioning were not developed in spite of the diverse teaching strategies. He found Socratic seminars to have value in reading and précis courses (summarizing text) in which student-led discussion encouraged more thoughtful discussion and learning. Although the uneven attendance was a problem, the feedback from students was mainly positive, indicating that the approach could be used to develop critical literacy. Likewise, according to [Mahmud and Tryana \(2023\)](#), Socratic questioning was found to significantly enhance reading comprehension in English majors at Pamulang University, as indicated by their higher post-test scores.

[Manurung and Siregar \(2018\)](#) also underlined its usefulness in developing speaking and critical thinking. They demonstrated in their qualitative study that Socratic discussion of viewpoints, evidence, and assumptions prompted deeper responses and interaction in the classroom, even among typical problems such as low confidence and poor vocabulary. [Kusmaryani \(2017\)](#) also proved that the integrated model of Socratic Questioning in an EFL class at the Borneo University of Tarakan, Indonesia, managed to obtain a notable enhancement in speaking and critical thinking, based on the Wilcoxon ranking test ($p\text{-value} < 0.05$). In this way, this study indicates that there was a remarkable change in the ability of the students to speak and think critically following the application of the Socratic Questioning method. Based on the above-mentioned studies, it can be seen that the 5E Inquiry-Based Learning Model and Socratic Seminar strategies can transform classroom dynamics and improve the process of learning. This pairing of teaching models relates to and influences the learning of the students in terms of the sociocultural theory developed by [Vygotsky \(1978\)](#), which reflects the process of knowledge acquisition by the learners based on interactions or exchanges with others. This idea centres on the processes of learning through social interaction, cultural tools, and social environment, and the relevance of language and social interactions in the learning process ([Chand, 2023](#)).

Flipped technology integration transforms traditional classroom dynamics by reversing in-class instruction and homework, offering self-regulation and critical thinking. Rooted in Dewey's constructivist learning theory, it emphasizes active, hands-on experiences to build knowledge in real-world contexts ([Cobb, 2024](#); [Jiang et al., 2023](#); [Pelech, 2010](#); [Richardson, 2005](#)). In this model, students access online instructional content at home to prepare for interactive in-class activities and discussions ([Bergmann & Sams, 2012](#)). This approach enhances engagement, promotes collaboration, and supports personalized learning. Earlier studies show that flipped learning improves comprehension of the text in a number of contexts in education. A study conducted by [Al-Sobh and Al-Khamaiseh \(2025\)](#) used a quasi-experimental approach to investigate how the flipped classroom affected the reading comprehension and attitudes of 20 first-year English language major students in Jordan. Participants were divided into two groups: one that received instruction in a flipped classroom (the experimental group) and the other that received traditional instruction (the control group). A reading achievement test was used to evaluate the pre- and post-test results. Descriptive statistics, t -tests, and ANCOVA were used for analysis. The experimental group's reading comprehension and motivation significantly improved, according to the study, which also suggested using the flipped classroom model to improve student engagement and learning outcomes.

Table 1 provides a detailed overview of a critical reading lesson from this study, which was designed using the 5E inquiry learning model and incorporates Socratic seminars in a flipped classroom setting. Each teaching phase is carefully designed to serve distinct pedagogical functions.

Table 1. Instructionally-aligned lesson plan for the 12-week Critical Reading course.

12-week instructional lesson			
Flipped classroom	Before class	• Promote independent learning by providing students with pre-reading materials to explore at home (Using CANVAS)	
	During class	Phase 1: Engage	• Spark curiosity and capture students' interest.
		Phase 2: Explore	• Assess students' understanding through pre-reading materials (Out-of-class reading). • Allow students to ask questions and clarify doubts or ambiguous information.
Flipped classroom	During class	Phase 3: Explain	• Present essential concepts and terminology related to the reading materials.
		Phase 4: Elaborate (Socratic seminar integration)	• Foster collaborative discussions focused on the text, utilizing the Socratic seminar approach. 
		Phase 5: Evaluate	• Give students the opportunity to assess and reflect on their learning, using their new insights in real-world contexts.

3. METHODS

3.1 Setting and Participants

This research utilized a quasi-experimental design with a one-group pretest-post-test design. The population consisted of 212 active prospective Thai undergraduate students in their first to fourth years, enrolled in the Program of English Education from the Faculty of Education at a Thai public university in the northeastern region of Thailand. This sample provided a diverse representation of students across different academic years, allowing for a comprehensive analysis of the intervention's impact on various stages of undergraduate study.

In this study, the participants were purposively chosen based on specific criteria: firstly, they needed to be native Thai speakers; secondly, to have a minimum of 10 years of experience of EFL; thirdly, to be current students in the Faculty of Education at a Thai public university; and finally, to have completed all required English courses in their curriculum with a minimum of grade C, including: (1) English Speaking and Listening 1 and 2, (2) English Structure 1 and 2, (3) English Phonology, and (4) English Reading and Writing Techniques. The participants were also enrolled in Analytical Reading Course for the 2022 academic year. The selected participants who met the criteria were 59 second-year undergraduate students majoring in English education. They were required to take a critical reading test created by the researchers to assess their English reading comprehension skills. Students who scored below 10 out of 20 were identified as having low reading abilities and were considered for participation. This cutoff criterion resulted in 33 students being selected as the target participants in this study.

3.2 Instrumentation

The research tools utilized in this study included a 12-week lesson plan, a critical reading pre- and post-test, and a self-reflective engagement questionnaire. The analysis was conducted using Microsoft Excel and the statistical software suite developed by IBM, Statistical Package for the Social Sciences (SPSS) version 29. All instruments were validated for the Index of Item-Objective Congruence (IOC) assessment and reliability by three invited experts specializing in English language education, TESOL, and Curriculum and educational development.

3.2.1 12-week lesson plan

The lesson plans encompass twelve lessons which utilize inquiry-based learning under the 5E Model combined with a Socratic approach within a flipped classroom environment. The twelve plans clearly state the terminal objectives (TOs) and enabling objectives (EOs), while learning activities can be classified either as in-class activities (120 minutes) or out-of-class activities, which typically involve pre-reading tasks online, along with follow-up exercises designed to help learners prepare for discussions carried out in class. A range of critical reading skills, such as identifying tones and moods, understanding implied ideas, and inferring information from texts, was systematically introduced through instructional videos. At the same time, students engaged with ten diverse reading topics to reinforce and apply these skills. The students are required to do pre-class assignments using the Canvas LMS platform. Finally, three experts assessed the lesson plans in terms of their content and construct validity using the Index of Item-Objective Congruence (IOC) method.

3.2.2 Critical reading comprehension pre and post-test

The pre and post-test was designed to take two forms: (1) multiple-choice (Questions 1-18) and (2) short response (Questions 19-21). The tests included nine simplified reading passages with a range of 100 to 400 words and a wide range of different topics. The primary genres applied were expository and argumentative writings because they can be used to encourage interaction and critical thinking. To ensure that the texts were at the right reading level of the students and to remove possible confounders, the texts were initially tested to determine readability using the Flesch-Kincaid technique (Spadaro et al., 1980). Pretesting was done to measure the content validity of test items through the Index of Item-Objective Congruence (IOC) before the experimentation, and the tests could be revised and used as pilot tests. Moreover, the Kuder-Richardson formula 20 (KR-20) was also applied to determine the reliability of the multiple-choice questions that were included in the test, as the reliability coefficients were 0.85 and 0.87 in the pretest and post-test, respectively. The result was that Questions 1-18 were highly reliable. Moreover, the inclusion of a short response section allowed students to provide brief answers regarding their critical reading skills. To determine the reliability for this part, the Pearson Product Correlation was used, whereby a pair of trained evaluators allocated scores based on a self-made holistic rubric designed explicitly for short responses (Questions 19-21). Each item was scored on a scale of 1 to 3, with 3 indicating a strong connection to key concepts, while 2 signified partial relevance, and 1 represented a misleading or inadequate response. The interrater reliability between the two raters was considered reliable, and the interrater agreement result yielded 0.82, which indicated a considerably high level of agreement.

3.2.3 Self-reflective questionnaire

The self-reflective questionnaire aimed to assess students' engagement in a 12-week intervention. It utilized a 5-point Likert scale and consisted of two sections adapted to measure participants' engagement in classroom activities. Section I covers demographic information to gather demographic details, including gender, age, and year of study. Section II asked about the frequency of engagement, where it required the participants to indicate how often they engaged

with the 5E inquiry-based learning model combined with Socratic seminar in a flipped classroom and included 21 items categorized into three constructs of reading engagement: (1) affective, (2) cognitive, and (3) behavioural. The following criteria were applied for this scale. The options in the questionnaire included 'always' (5), 'often' (4), 'sometimes' (3), 'rarely' (2), and 'never' (1). The scores measuring students' engagement in the reading class were assessed using the median value for interpretation, with the score representation of the different levels of engagement: 4.51-5.00 means 'very high', 4.00-4.50 means 'high', 3.50-3.99 means 'moderate', 3.00-3.49 means 'low' and 2.00-2.99 means 'very low'. Three experts assessed content validity before the implementation of the questionnaire with the participants. Following this, the questionnaire was piloted with a similar group of students sharing characteristics with the intended participants. After collecting data from the pilot study, the reliability coefficient (Cronbach's alpha) formula was applied to evaluate the reliability of the questionnaire based on 21 standardized items or statements. The results yielded a reliability of 0.712, indicating that the questionnaire was reliable. The satisfactory reliability score supports the consistency and dependability of the engagement data collected throughout the intervention.

3.3 Research Procedure

The study was conducted over 12 weeks, with students dedicating Wednesday afternoons to their participation, as this was the time they were free from their regular class schedules. In the first week, a critical reading pre-test was given to participants. From the second to the twelfth week, they engaged in 120-minute lessons based on the 5E inquiry teaching model, combined with Socratic seminars through the flipped classroom. After the intervention, the participants completed a critical reading post-test, followed by a self-reflective survey to assess their engagement throughout the reading sessions during the twelfth week. The study received IRB (Institutional Review Board) approval, and participants signed informed consent forms outlining the study's purpose, data use, confidentiality, anonymity, and withdrawal rights. Forms were provided in Thai for clarity. Data collection followed safety protocols, with information securely stored on a password-protected computer and in a secure location. Data are retained for five years before disposal.

3.4 Data Analysis

The data analysis process employed SPSS software version 29 for Windows. A normality test was conducted using the Kolmogorov-Smirnov method, yielding a pretest value of 0.142 ($p = 0.87$) and a post-test value of 0.119 ($p = 0.200^*$), indicating that the pretest and post-test scores for critical reading comprehension followed a normal distribution. A paired-sample t -test was conducted to address both research questions and to compare the mean differences between pretest and post-test scores. Additionally, the researchers applied descriptive statistics to the qualitative data from the self-reflective questionnaires, presenting the results as Means (M) and Standard Deviations (SD).

4. RESULTS

4.1 Effects on Thai Tertiary Students' Critical Reading Comprehension

The first research question addresses the extent to which the flipped 5E inquiry-based learning, combined with a Socratic seminar, enhances tertiary students' critical reading comprehension. This section examines the descriptive statistics from the reading comprehension pretest and post-tests, for which the mean, minimum, and maximum scores were computed, along with the standard deviation. The results of descriptive statistics are detailed in Table 2.

Table 2. Descriptive statistics of pre-/post-test on students' critical reading.

Critical reading	<i>N</i>	Max.	Min.	<i>M</i>	<i>SD</i>
Pre-test	33	20	10	14.73	2.98
Post-test	33	24	15	18.61	2.69

Table 2 shows that there were 22 test items in both the pretest and post-test, with a total score of 30 points. The average pretest score was 14.73 ($SD = 2.98$), with scores ranging from a minimum of 10 to a maximum of 20, whereas the average post-test score was 18.61 ($SD = 2.69$), with a minimum score of 15 and a maximum score of 24. The critical reading post-test showed higher mean, minimum, and maximum scores, accompanied by a small reduction in standard deviation (SD).

The first research question sought to determine any significant difference between the critical reading comprehension scores on the pretest and post-test. A dependent sample *t*-test (or paired samples *t*-test) was used to evaluate the participants' reading ability before and after the intervention. The post-test scores were compared to the mean pretest score to assess how effectively the 5E inquiry-based learning approach, combined with Socratic seminar in a flipped classroom, enhanced students' critical reading comprehension. Addressing the first research question, Table 3 presents results on significant differences between pretest and post-test critical reading comprehension scores. A paired samples *t*-test was used to compare participants' reading abilities before and after the intervention.

Table 3. The paired sample *t*-test results on students' critical reading.

Critical reading	Mean difference	<i>SD</i>	<i>t</i>	<i>df</i>	<i>p</i>
Pre-test and Post-test	3.879	2.595	8.586	32	0.001

* $p < 0.05$

Table 3 shows that the participants undergoing the treatment demonstrated a significant improvement in their critical reading ability at the 0.05 level ($p = 0.001$). This finding indicates that, on average, the post-test reading comprehension scores were higher than those of the pre-test. Therefore, the researchers accepted the hypothesis (H_1) stating that: the flipped 5E inquiry-based learning combined with Socratic seminar can significantly enhance Thai tertiary students' critical reading comprehension.

To examine the subtle distinctions within critical reading comprehension, overall mean scores from the pre-test and post-test were analysed across the four components outlined in Barrette's taxonomy, using data from the critical reading test. This assessment measured the students' understanding of the main idea, along with their ability to make inferences, their skill in differentiating between fact and opinion, and their capacity to identify mood and tone. The detailed results are set out in Table 4.

Table 4. The paired sample *t*-test on the critical reading test categorized by each critical reading component of Barrette's taxonomy.

Barrette's taxonomy (Higher-order thinking)	Critical Reading components	Mean difference	<i>SD</i>	<i>t</i>	<i>P</i> (2-tailed)
Inference	Making inferences	1.939	1.676	6.648	< 0.001
Evaluation	Comprehending the implied main idea	1.273	1.989	3.677	< 0.001
Evaluation	Distinguishing fact and opinion	1.667	2.231	4.291	< 0.001
Appreciation	Identifying mood and tone	1.576	2.359	3.837	< 0.001

Table 4 reveals that the students demonstrated a significant improvement in their ability to make inferences at the 0.05 level, as they were able to locate and infer meaning from the text ($t = 6.648$, $p < 0.001$). The participants also demonstrated a statistically significant enhancement when it came to understanding the implied main idea, at the 0.05 level ($t = 3.677$, $p < 0.001$). Furthermore, they experienced a significant improvement in their ability to differentiate between

fact and opinion following the intervention, at the 0.05 level ($t = 4.291, p < 0.001$). Additionally, students achieved significantly higher mean scores post-intervention for the fourth component (which focused on identifying mood and tone), at the 0.05 level ($t = 3.837, p < 0.001$).

4.2 Effects on Thai Tertiary Students' Reading Engagement

The second research question examines how the flipped 5E Inquiry learning model, combined with Socratic seminar, impacts tertiary students' reading engagement. The participants rated a five-point Likert scale questionnaire (5 = Always, 1 = Never) to indicate their engagement frequency throughout the course. The results provide descriptive statistics, including mean and standard deviation for each component as set out in Table 5.

Table 5. Self-reflective engagement questionnaire results.

Statements	<i>M</i>	<i>SD</i>	Engagement level
Affective engagement			
I enjoy reading the assigned reading materials.	3.61	0.788	Moderate
I feel that the assigned reading material is harder for me than for many of my classmates.	3.67	0.595	Moderate
I feel engaged and enjoy doing a text-based discussion in the classroom	3.79	0.545	Moderate
I find it hard and feel discouraged to finish and read long English texts.	3.82	0.808	Moderate
I feel easily distracted and lose focus when reading English text	3.85	0.618	Moderate
I feel more willing to read the English text	4.03	0.847	High
I feel more confident and ready when studying in the reading class	4.18	0.808	High
Total	3.85	0.716	Moderate
Cognitive engagement			
I can explain what I have read in the materials	3.79	0.781	Moderate
I learned and expanded some new and useful vocabulary from the reading materials provided.	3.79	0.650	Moderate
I can correctly answer questions based on the reading materials that I have read.	3.76	0.614	Moderate
I can distinguish between fact and opinion when reading the text.	3.73	0.944	Moderate
I can draw conclusions and make inferences from reading materials.	3.85	0.834	Moderate
I can find and locate the implied main idea when reading the text.	3.52	0.834	Moderate
I can identify the mood and tone and understand what the author is trying to convey when I read the materials.	3.55	0.754	Moderate
Total	3.71	0.773	Moderate
Behavioural engagement			
I do everything I can to complete my reading assignments	4.21	0.696	High
I try my best to do the reading assignments even if they are difficult	4.33	0.692	High
I spend as much time as I need to work on my reading assignment	4.39	0.609	High
In the reading class, I raise my hand to share my perspective and answer the teacher's question.	4.48	0.619	High
In the reading class, I listen and take notes attentively when the teacher gives a lecture.	4.36	0.549	High
I carefully read the materials my teacher has given me, both inside and outside the classroom.	4.39	0.556	High
I do not let other activities distract me from reading the assigned material	4.27	0.839	High
Total	4.35	0.651	High

Table 5 shows distinct patterns in students' reading engagement across affective, cognitive, and behavioural domains. The affective domain's highest-score is in "I feel more confident and ready when studying in reading class" ($M = 4.18, SD = 0.808$), reflecting students' reading readiness and confidence. Conversely, the lowest score is for the statement "I enjoy reading the assigned reading materials" ($M = 3.16, SD = 0.788$), indicating reduced student enjoyment. Within the cognitive domain, the statement "I can draw conclusions and make inferences from reading materials" achieved the highest mean score ($M = 3.85, SD = 0.834$), showing students' ability to

predict from concrete textual evidence. In contrast, the lowest score was for the statement “I can find and locate the implied main idea when reading the text” ($M = 3.52$, $SD = 0.834$), suggesting difficulties in interpreting implicit main or central ideas. In the behavioural domain, the statement “In the reading class, I raise my hand to share my perspective and answer the teacher’s questions” received the highest score ($M = 4.48$, $SD = 0.619$), highlighting active participation in classroom discussions. On the other hand, the item “I do not let other activities distract me from reading the assigned material” scored lowest ($M = 4.27$, $SD = 0.839$), highlighting challenges in maintaining focus and indicating varying engagement levels and areas for instructional improvement.

5. DISCUSSION

This research showed that when the 5E Model was combined with a Socratic approach in a flipped classroom, there was a positive effect upon learners’ performance in critical reading, according to the improved post-test outcomes. The results are confirmed by [Ermawati et al. \(2018\)](#), [Castrillón \(2020\)](#), and [Tarawneh \(2024\)](#), who also reported enhanced student interactions with texts along with better comprehension when an inquiry-based approach was employed. Moreover, the benefits from the integration of these teaching approaches and technologies resulted in a superior learning process. The Socratic component promoted more profound thought, especially during the Elaborate stage, and students were able to express themselves with greater confidence, leading to improved test results. This finding is in line with the research of [Kusmaryani \(2017\)](#) and [Manurung and Siregar \(2018\)](#), who demonstrated the beneficial impact of Socratic methods on enhancing critical thinking abilities and advancing language skill development. In the flipped classroom, learning is supported through the provision of materials to facilitate pre-reading skills, which assist learners in analysing texts from different points of view. [Ma \(2023\)](#) and [Al-Sobh and Al-Khamaiseh \(2025\)](#) had all reported that the flipped classroom model enables learners to interact with the material at their own pace and encourages them to contribute in class in a more meaningful manner. The instructional approach is in alignment with the Constructivism and Sociocultural theories of Dewey, in which emphasis is placed upon constructing knowledge through experience ([Cobb, 2024](#); [Jiang et al., 2023](#); [Pelech, 2010](#); [Richardson, 2005](#)).

In this study, it was further discovered that the level of reading engagement across the three dimensions – cognitive, affective/emotional and behavioural engagements – is directly influenced by the Flipped 5E Inquiry Instruction with Socratic seminar in a 12-week reading lesson. The questionnaire on self-reflective engagement confirmed that behavioural engagement was high, as learners were willing to contribute actively to group discussions. However, cognitive and emotional engagement were only rated as moderate, although learners did report increased motivation and confidence, leading to a deeper cognitive interaction with the study texts. [Smallhorn et al. \(2015\)](#), [Wheatley \(2018\)](#), and [Chakawodza et al. \(2025\)](#) reported similar findings, confirming the beneficial effects of using the 5E Model along with a flipped classroom approach to bring about improvements in learner engagement.

To conclude, critical reading skills improved when an integrated teaching approach combining inquiry-based learning, Socratic seminars, and the flipped classroom was used. Such an approach improved critical reading, levels of student engagement and collaboration, and offered significant implications to achieve better outcomes in the teaching of EFL and ESL. When this integrated model was employed, teachers could deliver student-centred interactive lessons that supported active participation and the development of critical reading skills through deeper engagement with the study texts. An inquiry-based approach allowed learners to actively construct knowledge, while critical discussions were supported by a Socratic classroom, which encouraged higher-order thinking. This strategy was reinforced by the flipped classroom, which helped learners engage with teaching materials at their own pace before lessons, ensuring that subsequent classroom activities became more meaningful. Together, these techniques enhanced engagement and improved reading comprehension and learning outcomes.

6. CONCLUSION

The results of this study demonstrated that in the context of EFL students in a Thai university, both engagement and critical reading skills improved after integrating the 5E model with Socratic seminars in a flipped classroom environment. Improvements were observed in students' critical reading scores and subskills such as inference-making, identifying facts, and understanding tone. Additionally, the approach fostered high behavioural engagement and moderate affective and cognitive engagement, boosting curiosity, motivation, and participation in reading English texts.

However, despite its generally positive outcomes, this study has several limitations and offers recommendations for future research. Firstly, the generalizability of the findings is limited by using non-probability sampling and a restricted sample, which consisted solely of English major students from a single Thai university. This sampling approach makes it difficult or impossible to generalize the results to a broader population. Future research would benefit from involving a larger and more diverse group of participants, including those from various academic fields and educational backgrounds. More so, applying this method across different text types in reading subjects could offer a more thorough understanding of its overall effectiveness.

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