J-Shelves of Indragiri (JSI)
https://ejournal-fkip.unisi.ac.id/shelves
Email: jsipbifkipunisi@gmail.com
DOI: https://doi.org/10.61672/jsi.v8i2.3875

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e-ISSN: 2721-205X
pp. 382-402

EXPLORING EFL STUDENTS' CRITICAL THINKING PROCESSES IN ARGUMENTATIVE WRITING THROUGH PROBLEM-BASED FLIPPED CLASSROOM

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Article Info

Article History
Received: 03-11-2026
Revised:11-11-2026
Accepted:11-11-2026
Published:12-11-2026

Keywords
Critical thinking process;
Argumentative writing;
Problem-based learning;
Flipped classroom;
EFL secondary education

Abstract

Argumentative writing is a cognitively complex productive skill in English as a Foreign Language (EFL) education, requiring learners to coordinate logical reasoning, evidence synthesis, and rhetorical persuasion. While quantitative gains of blended instructional models have been widely documented, empirical inquiries capturing the qualitative trajectories of how secondary EFL learners negotiate critical thinking during writing remain scarce. This study explored senior high school students' critical thinking processes during argumentative writing instruction facilitated by a Problem-Based Flipped Classroom model. Designed as the qualitative explanatory phase of an explanatory sequential mixed-methods study, this research investigated four twelfth-grade students selected purposively based on their writing achievement profiles (high, moderate, and developing) at SMA Negeri 12 Bulukumba. Data were gathered through semi-structured interviews, recursive drafting artifacts (pre-outlines, intermediate drafts, and final essays), and peer review sheets, and analyzed using the Miles, Huberman, and Saldaña interactive analysis framework. Methodological triangulation, member checking, and peer debriefing were conducted to establish qualitative trustworthiness. The findings demonstrate that the integrated model facilitated students' critical thinking across five interrelated dimensions: (1) idea generation and information seeking, (2) problem analysis and contextual fact-view connection, (3) logical reasoning and argument construction, (4) critical evaluation and recursive self-revision, and (5) metacognitive reflection and feedback utilization.

INTRODUCTION

Writing represents one of the most vital yet cognitively demanding productive skills in English as a Foreign Language (EFL) education. In senior high school settings, argumentative writing requires learners not only to demonstrate linguistic accuracy but also to formulate clear thesis statements, justify their viewpoints, and substantiate claims using relevant and coherent reasoning (Isnawati & Novitasari, 2025; Saksopin et al., 2024). Unlike narrative or descriptive tasks that rely primarily on chronological recollection or perceptual detailing, argumentative discourse necessitates higher-order cognitive processing

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(Taheri & Nazmi, 2021). Learners must critically evaluate complex issues, consider multiple perspectives, and logically organize persuasive arguments to persuade their intended readers (M. Pratiwi & Arifin, 2025; Saputra et al., 2021). Consequently, effective argumentative writing instruction must bridge the acquisition of grammatical forms with the strategic scaffolding of critical thinking.

Despite its curricular prominence, senior high school EFL learners consistently experience substantial barriers when producing argumentative texts. Diagnostic observations and instructional assessments at SMA Negeri 12 Bulukumba revealed that twelfth-grade learners frequently experience acute cognitive blockages, struggle to synthesize supporting arguments, and rely heavily on disjointed literal translation. In conventional teacher-fronted classrooms, instruction is dominated by passive textbook lecturing and impromptu drafting under tight temporal limits (Ariyanti, 2016; Negari, 2011; Saputra et al., 2021). In such settings, students face concurrent processing demands generating topical ideas, searching for appropriate English syntax, and structuring discursive arguments simultaneously which induces severe cognitive overload (Sweller, 1988).

A compelling pedagogical response to these instructional challenges is the integration of Problem-Based Learning (PBL) within a Flipped Classroom model. Problem-Based Learning is an established learner-centered approach that anchors learning within authentic, real-world problems, thereby fostering critical inquiry, analytical argumentation, and collaborative problem-solving (Arends, 2012; Barrows, 1986; Hmelo-Silver, 2004). However, a recurring pedagogical obstacle in implementing PBL within standard foreign language schedules is the severe constraint of instructional time required for deep problem exploration (Hung, 2011; Purnomo et al., 2025). To alleviate this temporal bottleneck, the Flipped Classroom model shifts direct content transmission such as conceptual genre definitions, text organizations, and instructional video overviews to independent pre-class study via digital platforms like WhatsApp and YouTube (Bergmann & Sams, 2012; Bishop & Verleger, 2013). Consequently, valuable face-to-face

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classroom meetings are repurposed from passive listening into dynamic collaborative problem-solving, structured peer dialogues, teacher conferencing, and recursive drafting (Fitrah et al., 2025; Kurniawati, 2025).

Although empirical literature has extensively reported quantitative gains attributable to flipped instruction, such as increased test scores and broad engagement metrics (McLaughlin et al., 2014; Roach, 2014; Wahyuni & Saraswati, 2023) substantive research gaps persist. Existing studies predominantly employ pre-test and post-test experimental designs that measure static product outcomes, leaving the internal cognitive trajectories and qualitative nuances of students' critical thinking largely unexplored (Ilyas & Arifin, 2025; Tawfik & Christopher, 2015; Wirantaka et. al., 2022). Little empirical documentation clarifies how adolescent EFL writers in regional contexts navigate epistemic dilemmas, evaluate conflicting claims, and execute metacognitive self-regulation when supported by pre-class digital scaffolding combined with in-class problem-based peer inquiry. To address this empirical gap, the present study explicitly investigates the qualitative cognitive mechanisms activated by this integrated instructional model, guided by two specific research questions: *1. How do senior high school EFL learners navigate students' critical thinking processes across idea generation, problem analysis, argument development, evaluation, and metacognitive reflection within an integrated Problem-Based Flipped Classroom?* and *2. In what ways are these cognitive processes manifested concretely in students' argumentative writing drafts and recursive revision behaviors?*

LITERATURE REVIEW

Critical Thinking in EFL Argumentative Writing: Cognitive Dimensions and Argumentation Schemas

Critical thinking is widely recognized as a foundational higher-order competency required for academic reasoning and evidence-based communication (Adamson & Darling-Hammond, 2015; Masnunah et al., 2022). Within second and foreign language education, critical thinking transcends passive knowledge recall, requiring students to interpret, analyze, infer, evaluate, explain, and self-

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regulate their reasoning (Facione, 2015). In argumentative writing, these cognitive operations intersect with Toulmin's (2003) structural argumentation model, which posits that defensible discourse requires articulating clear claims, establishing corroborating data, formulating logical warrants that connect data to claims, acknowledging counterarguments through concession, and providing rebuttal evidence. According to Flower and Hayes' (1981) Cognitive Process Theory of Writing, composing is a non-linear problem-solving enterprise involving continuous planning (generating ideas and setting goals), translating (transforming thought into language), and reviewing (evaluating and revising text against communicative goals). Novice EFL writers typically default to a 'knowledge-telling' strategy (Bereiter & Scardamalia, 1987), retrieving raw memories into written syntax without rhetorical transformation. In contrast, fostering critical thinking guides learners toward a 'knowledge-transforming' model, wherein rhetorical challenges stimulate continuous cognitive restructuring, critical self-revision, and balanced textual argumentation (Brown, 2007; Hyland, 2022).

Theoretical Synthesis: Scaffolding Critical Thinking via PBL Syntax and Flipped Classroom Dynamics

Rather than treating critical thinking, Problem-Based Learning, and the Flipped Classroom as disconnected educational concepts, this study establishes an integrated theoretical synthesis explaining how the pedagogical architecture of flipped problem-based instruction directly activates and scaffolds specific critical thinking indicators during argumentative composing. This synthesis is grounded in Cognitive Load Theory (Sweller, 1988) and Social Constructivism (Vygotsky, 1978).

Under conventional classroom conditions, EFL learners confront simultaneous extraneous cognitive load: they must simultaneously decipher unfamiliar thematic topics, organize rhetorical claims, and retrieve target-language grammar and lexis (Sweller, 1988; Taheri & Nazmi, 2021). The pre-class flipped phase systematically decouples these cognitive demands. By delivering multimodal authentic video scenarios (e.g., via YouTube) and preliminary inquiry prompts prior to class, the flipped component activates

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existing cognitive schemata (Rumelhart, 1980) and encourages self-paced information seeking. This offloads extraneous cognitive processing and activates Facione's (2015) interpretation and Flower and Hayes' (1981) idea generation dimension before drafting begins (Abeysekera & Dawson, 2015).

Subsequently, face-to-face instructional time is repurposed into a collaborative inquiry workshop operating within learners' Zone of Proximal Development (ZPD) (Vygotsky, 1978). Here, the five sequential syntax stages of Problem-Based Learning (Arends, 2012) function as direct instructional scaffolds for corresponding critical thinking operations:

1. Stage 1: Orienting Students to the Problem aligns directly with Problem Analysis and Fact-View Connection. Learners deconstruct ill-structured real-world controversies, identify conflicting stakeholder perspectives, and distinguish empirical facts from personal assumptions (Facione's analysis and inference).
2. Stage 2: Organizing Students for Study and Stage 3: Guiding Independent and Group Investigation activate Logical Reasoning and Argument Building. Small-group discourse compels students to gather corroborating data, cross-examine evidence, and formulate Toulminian claim-data-warrant structures to substantiate collective stances (Facione's explanation).
3. Stage 4: Developing and Presenting Artifacts transforms cognitive arguments into individual written texts. In this translating phase, students synthesize analyzed evidence into structured essays, formulating balanced thesis statements and anticipating counterarguments (Toulmin, 2003; Bereiter & Scardamalia, 1987).
4. Stage 5: Analyzing and Evaluating the Problem-Solving Process facilitates Critical Evaluation, Recursive Self-Revision, and Metacognitive Feedback Utilization. Through structured peer assessment using analytical rubrics (Brown, 2007) and formative teacher conferencing, learners externalize their evaluation criteria. This social interaction activates Facione's (2015) self-regulation, prompting writers to recognize rhetorical inconsistencies,

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detect linguistic deficits, and execute recursive textual revisions to polish their argumentative compositions (Barrett, 2005; Yew & Goh, 2016; Kurniawati, 2025).

Table 1. Outlines The Theoretical Connecting Instructional Phases, PBL Syntax, And Facilitated Critical Thinking

Instructional Phase	PBL Syntax & Instructional Activity	Facilitated Critical Thinking Dimension
Pre-Class Flipped (Asynchronous)	Viewing authentic video prompts; exploring external articles; taking exploratory schema notes	Dimension 1: Idea Generation & Information Seeking (Facione: Interpretation; Flower & Hayes: Planning)
In-Class PBL: Phase 1(Synchronous)	PBL Stage 1: Orienting students to authentic socio-scientific problems; identifying stakeholder tensions	Dimension 2: Problem Analysis & Fact-View Connection (Facione: Analysis & Inference)
In-Class PBL: Phases 2 & 3 (Synchronous)	PBL Stages 2 & 3: Organizing study groups; investigating evidence; debating claims and warrants	Dimension 3: Logical Reasoning & Argument Building (Toulmin: Claim-Data-Warrant; Facione: Explanation)
In-Class PBL: Phase 4 (Synchronous)	PBL Stage 4: Developing textual artifacts; drafting individual argumentative essays with counterarguments	Dimension 4: Critical Evaluation & Recursive Self-Revision (Bereiter & Scardamalia; Flower & Hayes: Reviewing)
In-Class & Post-Class: Phase 5 (Sync & Async)	PBL Stage 5: Evaluating problem-solving; structured peer review using Brown's rubric; recursive redrafting	Dimension 5: Metacognitive Reflection & Feedback Use (Facione: Self-Regulation; Brown: Rubric-Based Revision)

RESEARCH METHOD

Research Design

This study employed a qualitative descriptive case study design (Creswell, 2023; Merriam & Tisdell, 2016). It served as the qualitative explanatory phase for investigation conducted during the twelfth grade of the 2026/2027 academic year at SMA Negeri 12 Bulukumba, South Sulawesi, Indonesia. This qualitative case study was conducted to examine the underlying cognitive mechanisms, decision-making rationales, and reflective self-regulatory behaviors of learners engaged in the integrated Problem-based- Flipped Classroom.

Participant Selection and Profiles

The study focused on four key informants selected purposively from class XII.D, the experimental cohort receiving the Problem-Based-Flipped Classroom

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model. Purposive selection was governed by three predetermined criteria: (a) representation across distinct writing achievement and developmental strata (categorized through baseline argumentative writing scores and diagnostic pre-assessments into high, moderate, and developing proficiency); (b) consistent attendance and active participation across all asynchronous pre-class digital activities and in-class PBL sessions; and (c) willingness and communicative openness to articulate personal reflections, cognitive obstacles, and writing decisions during retrospective interviews. Four informants provided sufficient empirical depth to enable comprehensive within-case profiling and cross-case comparative pattern matching without data dilution (Miles et al., 2014):

a. Student A (AK – High Proficiency): Demonstrated strong baseline control of English grammatical structures, expansive vocabulary, and an established habit of preliminary text planning. Baseline writing score: 84/100.
b. Student B (PS – Moderate Proficiency): Possessed functional communicative vocabulary but struggled with paragraph coherence, counterargument integration, and initial idea structuring. Baseline writing score: 72/100.
c. Student C (ZU – Developing Proficiency): Experienced frequent lexical deficiencies, literal Indonesian-to-English translation habits, and difficulties distinguishing claims from general descriptions. Baseline writing score: 60/100.
d. Student D (MJ – Moderate Proficiency): Capable of generating varied viewpoints but frequently produced disorganized paragraphs with unsupported assertions. Baseline writing score: 70/100.

Instructional Implementation of the Integrated Model

The intervention spanned four intensive blended instructional cycles (90 minutes of face-to-face collaborative work per cycle, preceded by asynchronous pre-class activities). Two contentious socio-scientific themes served as inquiry prompts: The Educational and Ethical Ramifications of Generative AI in High School (Cycles 1–2) and Freedom of Expression versus Hate Speech Regulation

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on Digital Social Platforms (Cycles 3–4). Each cycle systematically executed three interconnected phases:

1. Pre-Class Preparation (Asynchronous via WhatsApp and YouTube, 2–3 days prior): The teacher shared multimodal video prompts, guiding inquiry questions, and vocabulary glossaries. Students engaged in individual inquiry, recorded schema-activation notes, and formulated preliminary questions.
2. In-Class Problem Inquiry and Drafting (Synchronous Face-to-Face, 90 minutes): Structured around the five core PBL syntax stages: (a) Orienting to the Problem (10 min) to unpack controversies and clarify rhetorical stances; (b) Organizing for Study (15 min) in small groups of 4–5 students with assigned analytical roles; (c) Guiding Investigation (20 min) through cross-examination of evidence and distinguishing factual data from opinions; (d) Developing Artifacts (30 min) via individual drafting adhering to Toulmin's structural conventions; and (e) Reflecting and Evaluating (15 min) through structured peer review using Brown's (2007) analytical writing rubric (content, organization, vocabulary, grammar, mechanics).
3. Post-Class Reflection and Revision (Asynchronous): Students conducted recursive self-revision incorporating peer critique and formative teacher annotations, submitting finalized portfolio essays alongside brief reflective learning log entries.

Data Collection and Analysis Procedures

Data were collected across all four instructional cycles using two primary sources: (1) Semi-Structured In-Depth Interviews lasting between 30 and 45 minutes conducted individually in Indonesian to prevent linguistic inhibition, audio-recorded, and transcribed verbatim; and (2) Textual Artifact Analysis encompassing pre-writing graphic organizers, initial rough drafts (Draft 1), annotated peer-review sheets, teacher notes, and revised final essays (Draft 2).

Data analysis followed the interactive framework of Miles, Huberman, and Saldaña (2014), comprising data condensation, data display, and conclusion

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drawing/verification. In the condensation stage, interview transcripts were open-coded and categorized into descriptive nodes, while drafting documents were examined to trace sentence-level and structural revisions across drafts. Thematic matrices were synthesized to display patterns across proficiency levels. Qualitative trustworthiness was established through methodological triangulation (cross-verifying interviews with textual artifacts), member checking with teacher, and peer debriefing with two external educational research specialists.

FINDINGS AND DISCUSSION

The qualitative findings demonstrate that the Problem-Based Flipped Classroom model systematically structured students' critical thinking processes during argumentative composing. Rather than treating writing merely as a mechanical linguistic task of translating isolated sentences, students described and exhibited active cognitive involvement across five central, interrelated dimensions.

1. Developing Ideas and Seeking Information

Pre-class video prompts delivered through YouTube and coordinated via WhatsApp served as a cognitive anchor, orienting learners to authentic controversies and prompting independent information seeking before writing commenced. Rather than encountering an intimidating blank page in class, students arrived with pre-activated schemata and personal notes.

"Iya sangat membantu, Miss. Karena kita bisa mencari referensi dulu sebelum menulis, bukan hanya di buku paket tetapi juga di internet."

("Yes, it really helps, Miss. Because we can look for references first before writing, not only in textbooks but also on the internet.") **Student A**

"Yes Miss, metode ini sangat membantu menghasilkan ide karena sebelum masuk kelas sudah diberikan video jadi bisa lebih banyak gagasan baru untuk menyelesaikan masalah yang diberikan."

("Yes Miss, this method really helps generate ideas because before entering the class we were given videos, so there were many new ideas to solve the assigned problem.") **Student B**

Empirical Textual Evidence: This exploratory behavior was directly reflected in students' pre-writing artifacts. In Cycle 1 (addressing AI in education),

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Student A's pre-writing notes contained specific references to external articles, outlining both algorithmic benefits (e.g., personalized grammar feedback) and ethical dilemmas (e.g., data harvesting and plagiarism). Even developing writers utilized this phase effectively; Student C's preliminary sheet listed concrete search keywords ('AI negative impact school', 'cheating machine'), showing a transition from passive confusion toward self-directed inquiry.

2. Problem Analysis and Connecting Contextual Facts, Views, and Arguments

During in-class collaborative PBL sessions, students progressed from basic idea gathering to analytical evaluation. Small-group discussions compelled learners to dissect multifaceted problems, distinguish objective evidence from subjective assertions, and synthesize divergent perspectives.

"...awalnya kan kita diberi video yang meminta kita untuk berargumen lewat tulisan, jadi otomatis kita harus mencari tahu sebelum memberikan pendapat lewat tulisan."

("...at first we were given a video prompting us to argue through writing, so automatically we had to investigate first before stating opinions in writing.") **Student A**

"Saat memecahkan masalah Miss, awalnya agak kesulitan Miss karena belum terlalu bisa tapi karena dijelaskan juga di grup baru paham caranya bagaimana. Jadi saya hubungkan saja fakta yang sudah ada dan pikiran saya Miss, jadi lebih banyak bisa ditulis."

("When solving the problem, Miss, at first, it was difficult because I wasn't very capable, but because it was explained in the group, I understood. So, I just connected existing facts with my own thoughts, and I had much more to write.") **Student B**

Empirical Textual Evidence: Textual progression across drafting stages demonstrated this analytical shift. In Draft 1 of Cycle 3 (Freedom of Expression on social media), Student D initially asserted: 'Social media is bad because many people get angry and write hate speech.' Following group problem analysis, his final draft demonstrated clear fact-view differentiation and stakeholder analysis: 'Although social media provides universal platforms for free speech, unregulated expressions often cross into cyber-harassment, requiring legal moderation to protect vulnerable users.'

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3. Enhancing Logical Reasoning and Argument Development

The third cognitive dimension centered on students' capacity to organize claims into coherent, evidence-grounded argumentative structures conforming to Toulmin's model (claim, supporting evidence, and warrant).

"Saya merasa lebih logis Miss, karena saya menyusun sesuai dengan pandangan umum lalu saya kaitkan dengan pandangan saya."

("I felt it was more logical, Miss, because I organized according to common perspectives and then connected them to my personal viewpoint.") **Student B**

"Tulisan saya berikan data pendukung Miss, jadi lebih mudah dipahami sama pembaca."

("I provided supporting data in my writing, Miss, so that it is more easily understood by the readers.") **Student C**

"Menurut saya lebih logis, Miss. Karena saya menambahkan beberapa pandangan umum kemudian saya bisa simpulkan, Miss."

("In my opinion, it is more logical, Miss. Because I added several general views and then I could conclude, Miss.") **Student D**

Empirical Textual Evidence: Document analysis demonstrated noticeable structural development. In Cycle 1, Student B's Draft 1 presented disconnected claims lacking evidence. In her final submission, she structured a cohesive paragraph integrating a clear claim, empirical warrant, and concluding synthesis: 'Artificial intelligence tools cannot completely replace classroom teachers because they lack human empathy and emotional understanding. Studies from our group discussion show that while AI can grade grammar quickly, teachers provide moral support when students fail. Therefore, AI should only be treated as a supportive assistant.'

4. Critical Evaluation and Recursive Self-Revision

Rather than treating initial drafts as final products, informants engaged in evaluative rereading and recursive textual restructuring. Students actively monitored their prose to eliminate logical gaps, resolve organizational disorientation, and correct linguistic inaccuracies.

"...awalnya saya membuat sebuah perencanaan dulu tentang apa yang akan saya tulis, lalu saya baca dan perbaiki kalau misalnya ada kesalahan atau ada yang ingin ditambahkan."

("...initially I made a plan of what I would write, then I read and corrected it

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if, for example, there were errors or things I wanted to add.") **Student A**

"Iya, karena menurut saya kalau tidak di revisi banyak salah kata dan urutannya terbalik-balik, jadi penting itu melakukan revisi untuk memperbaiki lagi tulisan."

("Yes, because in my opinion, without revision there are many incorrect words and the order is scrambled; therefore, revision is essential to improve the essay.") **Student B**

"Saya melakukan revisi Miss, supaya tulisannya saya perbaiki dan pembahasannya lebih jelas lagi, dan penting juga diperhatikan alurnya."

("I revised, Miss, so that I could fix the writing and make the discussion much clearer, and it is also important to pay attention to the flow.") **Student D**

Comparative document analysis revealed substantial qualitative revisions between Draft 1 and Draft 2. Student A transformed an initial 3-sentence thesis paragraph into a fully elaborated 5-sentence introduction containing a clear concession ('While critics argue that...') and a distinct, defensible thesis statement. Similarly, Student C deleted entire redundant sentences that had simply translated Indonesian idioms word-for-word, replacing them with focused topic sentences developed during in-class consultation.

5. Metacognitive Reflection and Feedback Utilization

The final dimension captured students' capacity to monitor their own learning, appraise textual clarity from an external audience perspective, and incorporate formative feedback from peers and the teacher.

"...saya memastikan bahwa tulisan saya sesuai dan relevan dengan konteks yang dibahas."

("...I made sure that my writing was appropriate and relevant to the context being discussed.") **Student A**

"Iye Miss, dari situ bisa muncul ide-ide yang bisa membuat tulisan lebih berkembang."

("Yes Miss, from peer feedback, new ideas emerged that helped my writing develop further.") **Student C**

"Membantu Miss, setelah mendapat masukan bisa menambah pengetahuan baru sehingga tulisan lebih baik lagi."

("It helped, Miss. After receiving input, it added new knowledge so that the writing became much better.") **Student D**

Empirical Textual Evidence: Annotated peer review sheets verified this reciprocal cognitive exchange. On Student B's Draft 1, a peer reviewer noted:

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'Your argument about social media is still too general. What is your concrete example?' In response, Student B inserted an empirical example regarding cyberbullying cases in Indonesian schools into Draft 2, directly demonstrating how external critical evaluation prompted substantive textual refinement.

Table 2: Summary of Students' Critical Thinking Processes in the Integrated Model

Indicators	**Cognitive Process**	**Student Reflection**	**Concrete Empirical Textual**
1. Idea Generation & Information Seeking	Schema activation; external information retrieval; contextual inquiry (Interpretation & Planning)	"Bisa mencari referensi dulu sebelum menulis, bukan hanya di buku paket tetapi juga di internet." (Student A)	Pre-class notes containing external URLs, bulleted pros/cons of AI, and keyword searches for evidence.
2. Problem Analysis & Fact-View Connection	Deconstructing complex controversies; differentiating verified evidence from opinion (Analysis & Inference)	"Awalnya agak kesulitan... Jadi saya hubungkan saja fakta yang sudah ada dan pikiran saya." (Student B)	Shift from raw emotional statements in Draft 1 to balanced, evidence-supported thesis statements in Draft 2.
3. Logical Reasoning & Argument Building	Establishing claim-evidence-warrant chains; structuring counterarguments and syntheses (Explanation)	"Saya menyusun sesuai dengan pandangan umum lalu saya kaitkan dengan pandangan saya." (Student B)	Transformation of disjointed claims into Toulmin-aligned paragraphs featuring claims, empirical data, and warrants.
4. Critical Evaluation & Recursive Self-Revision	Critical rereading; identifying rhetorical inconsistencies; structural reorganization (Evaluation & Knowledge Transforming)	"Kalau tidak direvisi banyak salah kata dan urutannya terbalik-balik, jadi penting melakukan revisi." (Student B)	Marked draft revisions: reordered body paragraphs, corrected syntactic fragments, and refined transition words.
5. Metacognitive Reflection & Feedback Utilization	Audience-awareness monitoring; evaluating communicative impact; integrating formative peer critique (Self-Regulation)	"Setelah mendapat masukan bisa menambah pengetahuan baru sehingga tulisan lebih baik lagi." (Student D)	Inclusion of specific peer-suggested examples (e.g., local cyberbullying data) directly addressing reviewer annotations.

The qualitative findings provide compelling evidence that integrating Problem-Based Learning into a Flipped Classroom cultivates multifaceted critical thinking processes in EFL argumentative writing. These observed cognitive behaviors align closely with Facione's (2015) taxonomy of core critical thinking skills, encompassing interpretation, analysis, inference, explanation, evaluation,

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and self-regulation. In conventional writing instruction, EFL learners frequently experience cognitive overload because they are forced to simultaneously generate content ideas, manipulate unfamiliar foreign syntax, and structure paragraphs under strict time limits (Negari, 2011; Saputra et al., 2021). In contrast, shifting foundational conceptual exposure and problem orientation to the pre-class flipped phase conforms directly to Cognitive Load Theory (Sweller, 1988) and Schema Theory (Rumelhart, 1980). By exploring multimodal YouTube prompts at home via WhatsApp, students activated relevant schemata at their own pace, reducing cognitive strain and entering the classroom cognitively prepared to articulate sophisticated arguments.

Furthermore, the collaborative in-class inquiry of PBL served as an instructional scaffold within learners' Zone of Proximal Development (Vygotsky, 1978). Rather than engaging in superficial assertion writing, students actively debated real-world controversies such as artificial intelligence ethics and freedom of expression boundaries which catalyzed analytical problem exploration. This progression resonates with Toulmin's (2003) Model of Argumentation, wherein students transitioned from making isolated personal claims to constructing integrated networks of claims, warrants, corroborating data, and balanced conclusions (Hardini & Alberida, 2022). As observed by Hafizah et al. (2024) and Kurniawati (2025), contextualized problem exploration transforms argumentative writing into an authentic act of social inquiry, encouraging learners to evaluate divergent viewpoints and defend their rationales logically.

Most importantly, the findings illuminate a fundamental cognitive shift from the 'knowledge-telling' strategy typical of novice writers to the 'knowledge-transforming' process characteristic of critical composers (Bereiter & Scardamalia, 1987). Rather than treating writing as a linear transcription of memory, informants demonstrated iterative planning, continuous self-monitoring, and recursive revision (Brown, 2007; Flower & Hayes, 1981; Hyland, 2022). Students actively recognized structural discrepancies, monitored contextual relevance, and capitalized on formative peer feedback to refine their texts (Coffin et al., 2005; Wahyuni & Saraswati, 2023). Nonetheless, as noted in the interview data, learners

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continued to experience linguistic challenges regarding specialized vocabulary and paragraph cohesion, underscoring that critical thinking in EFL writing must be accompanied by targeted lexical scaffolding and explicit linguistic modeling (Nation, 2001; Taheri & Nazmi, 2021 The qualitative findings provide rich insight into how integrating Problem-Based Learning into a Flipped Classroom supports critical thinking processes in EFL argumentative writing. Grounded in Facione's (2015) taxonomy and Flower and Hayes' (1981) writing model, the data illustrate how adolescent EFL writers transition from reactive transcription to purposeful, analytical reasoning when supported by deliberate instructional scaffolding.

In standard EFL writing instruction, learners are typically expected to simultaneously brainstorm topical content, retrieve foreign language vocabulary, and navigate complex syntactic constraints (Negari, 2011; Saputra et al., 2021). This concurrent processing frequently overwhelms working memory capacity, consistent with Sweller's (1988) Cognitive Load Theory. In this study, the asynchronous flipped component decoupled idea acquisition from linguistic drafting. By engaging with multimodal video prompts on YouTube prior to class, students built situational familiarity and pre-activated relevant schemata (Rumelhart, 1980). This offloaded extraneous cognitive burdens, enabling learners to enter the face-to-face setting with greater conceptual confidence. These findings corroborate prior quantitative observations by Abeysekera and Dawson (2015) and Fitrah et al. (2025), while providing empirical evidence of how students leverage this cognitive space for self-directed inquiry.

During in-class PBL sessions, social constructivist scaffolding within the learners' Zone of Proximal Development (Vygotsky, 1978) fostered the development of problem analysis and logical reasoning. Rather than producing superficial personal assertions, learners engaged in collaborative debates on authentic socio-scientific issues. This dynamic directly facilitated the construction of structured arguments mirroring Toulmin's (2003) framework, as students learned to ground claims in empirical warrants and acknowledge opposing viewpoints. These results support findings by Kurniawati (2025) and Saksopin et al. (2024), who reported that authentic problem engagement enhances

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argumentative depth. However, our qualitative data extend their findings by demonstrating that this improvement is not merely linguistic; it stems from active peer debate that forces students to verbally evaluate contradictory viewpoints before committing them to paper.

Most significantly, the findings document an epistemic shift from Bereiter and Scardamalia's (1987) 'knowledge-telling' model to a 'knowledge-transforming' approach. Rather than viewing writing as a linear transcription of memory, informants engaged in recursive self-revision and metacognitive monitoring (Brown, 2007; Hyland, 2022). Students actively evaluated their drafts from the perspective of an external audience, using peer feedback to resolve rhetorical ambiguities and reorder disorganized arguments. These findings expand upon Wirantaka et al. (2022) and Ilyas and Arifin (2025) by identifying the concrete points during drafting where critical evaluation occurs: students first revised macro-level organizational structures (thesis clarity and paragraph sequence) before addressing micro-level linguistic concerns (lexical choice and grammatical mechanics).

Nonetheless, comparative analysis across proficiency levels revealed important pedagogical boundaries. While high-proficiency writers (Student A) seamlessly transferred conceptual insights into sophisticated prose, developing writers (Student C) continued to encounter linguistic friction, including limited specialized vocabulary and mother-tongue syntactic interference. This distinction aligns with Taheri and Nazmi's (2021) observation that critical thinking capacity in EFL writing cannot fully compensate for restricted linguistic proficiency. Therefore, pedagogical frameworks combining PBL and flipped learning must integrate explicit lexical and syntactic scaffolding alongside cognitive problem-solving to ensure balanced writing development.

CONCLUSION

This qualitative case study illustrates that an integrated Problem-Based Flipped Classroom model provides structured instructional support for cultivating critical thinking processes among senior high school EFL learners during

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argumentative writing. By decoupling conceptual inquiry from initial drafting, the flipped component facilitates independent information seeking and schema activation prior to class. Concurrently, in-class collaborative problem-solving engages learners in analytical inquiry, logical argument construction, recursive self-revision, and metacognitive reflection. As a result, writing evolves from a mechanical, linear exercise into an iterative, socially scaffolded process of knowledge transformation.

EFL educators are encouraged to adopt blended inquiry models that pair accessible multimodal pre-class resources with authentic, problem-driven classroom discussions. To optimize this approach, teachers should provide explicit scaffolding tools such as graphic argument organizers, clear peer-review protocols, and domain-specific vocabulary banks to help developing writers translate complex cognitive arguments into accurate, coherent English prose.

Several limitations should be considered when interpreting these findings. First, the qualitative inquiry was conducted with four purposively selected participants from a single class at SMA Negeri 12 Bulukumba over an intervention of four instructional meetings. While this enabled detailed examination of individual cognitive and drafting trajectories, the findings reflect this specific contextual setting and should not be generalized across all secondary environments. Second, data collection relied on retrospective self-reports and text-based drafting artifacts; future research could incorporate real-time think-aloud protocols or keystroke logging to capture moment-by-moment cognitive decisions during composing. Longitudinal studies across diverse institutional contexts and writing genres are recommended to examine the sustained impact of integrated problem-based flipped instruction.

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