Full Report

Development of Information Literacy Model to Enhance English-Major Students' Critical Thinking Skills

By

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Executive Summary

Background of the Study

Information Literacy (IL) skills have become an essential element for students, especially in higher education as the advancement of technology increases the complexity of the information landscape. Therefore, for students to evaluate the credibility and relevance of information they encounter, they need to be able to think critically. Despite efforts to integrate IL practices and tools like the CRAAP Test for evaluating information credibility into the Digital Media Literacy (DML) course at Mae Fah Luang University (MFU), students need help effectively demonstrating critical thinking and information analysis skills. This leads to a reflection on the teaching approach, suggesting the adaptive of IL components to better support students in evaluating online information sources.

Therefore, this study investigates the effectiveness of the Metacognitive Information Literacy (MIL) model in enhancing critical thinking skills among second-year English major undergraduates enrolled in the DML course. This model combines Information Literacy (IL) components with metacognitive practices, incorporating the five key strategies of formative assessment (FA), critical reading strategies, and the CRAAP test for evaluating information credibility. The study aimed to address two research questions: (1) To what extent does the MIL model enhance English-major learners' critical thinking skills? and (2) What is the level of learner satisfaction toward using the IL model for enhancing critical thinking skills?

Research Objectives

1. To assess the extent to which the implementation of the MIL model enhances critical thinking skills.
2. To investigate learners' satisfaction with the MIL model.

Research Methodology

This research employed a one-group pre-and post-test design with purposive sampling, involving 83 English major undergraduates enrolled in the DML course during the first semester of academic year 2023. Before the administration of the MIL model, the model was developed through a comprehensive review process. Additionally, the researchers established a baseline by assessing the participants using a critical thinking pre-test, followed by the MIL model intervention. The last part is a post-test and a satisfaction survey administration after the MIL intervention.

Research Results

Two key findings in this study include the enhancement of critical thinking skills and their satisfaction among participants after experiencing the MIL model. First, participants' average posttest score was higher than the pretest score This suggested that the integration of critical reading strategies, the CRAAP test, and the FA was crucial for students' enhancement in participants' critical thinking abilities. Moreover, students reported high levels of satisfaction with the MIL model. They highlighted the value of the model in facilitating classroom discussions, the encouragement to share ideas, and the engagement of discussions to the subject matter.

Practical Implications for Educators and Instructional Designers

This study offers a combination of a learning tool set from the IL model, the CRAAP Test, and the FA for higher education EFL learners and educators. The study highlights the importance of learners' involvement in their learning and responsibility for their learning process, as well as the scaffolding from peers and teachers in the classroom through a toolset that develops their metacognition. The process underneath the IL model strengthens students' metacognition while interacting with the teacher and peers, for it synthesizes various strategies for critically evaluating information. Moreover, the study has also shown that summative assessment tasks alone are inadequate for metacognitive development. Educators and instructional designers should apply group activities, instructions, scenarios, or individual assignments such as the ones integrated into this study for developing EFL learners' cognitive and

metacognitive skills. Students obtain skills in evaluating online sources and materials for their classroom assignments, and it sets them up to be lifelong learners.

Additionally, educators and instructional designers may find the pre- and post-test and metacognitive information literacy satisfaction survey beneficial in evaluating learners' critical thinking skills development and satisfaction with the formative assessment process, although it will need adaptation to fit the unique needs of their students and context.

Abstract

The objective of this study was to evaluate the effectiveness of the Metacognitive Information Literacy (MIL) model for enhancing learners' critical thinking skills, and to assess the satisfaction of students with this model incorporated into their learning experience. To achieve this goal, a one-group pre and post-test purposeful sampling design was employed. Data was collected from 83 English-major undergraduates enrolled in a course for digital media literacy course. Critical thinking assessments were administered before and after the implementation of the MIL model. Additionally, a satisfaction survey was administered to gather feedback from the participants on the MIL model intervention, inquiring about their satisfaction with the teaching instruction, engagement, and collaborative activities. The findings indicated that the MIL model significantly enhanced the critical thinking of participants, as evidenced by the comparison of pre- and post-test scores. The survey results also revealed high levels of satisfaction with the model's strategies to foster a cooperative learning environment, promote metacognition, and develop critical thinking abilities. The results of this study suggest that the MIL model can be valuable, particularly in supporting learners as they develop their ability to critically assess online sources and materials, both for their classroom assignments and for their lifelong learning endeavors. However, the study's limitation of using a one-group pre- and post-test research design suggests that future research should employ a true experimental design to ensure the true process-oriented teaching practices are evaluated.

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Chapter 1 Introduction

Advancements in technology has changed the way we teach English as a Foreign Language (EFL). Today's EFL classrooms are filled with "digital natives" – learners who do not know life without digital technologies. The latest disruptive innovations present a double-edged sword for learners; they provide a wealth of information and resources and also an over-abundance of unreliable and problematic knowledge sourced from the internet, social media, and big data. Therefore, Information Literacy (IL) has become a crucial skill for learners to navigate the complex information landscape and make informed decisions about the resources they encounter. As Fieldhouse and Nicholas (2008) stated, being digitally literate empowers learners to critically evaluate online information for credibility. They can also develop skills to analyze, synthesize, and contextualize information. The importance of IL, according to the Association of College and Research Libraries (2000), is critical as information resources accelerate, and people need to keep up with it. Mastering IL not only helps learners access information effectively, but also demonstrates how to utilize resources judiciously and transform them into valuable assets that can contribute to their personal, professional, and social development in the ever-changing information environment (Pramote Laolapha, 2020).

Developing IL skills helps EFL learners gain access to global information and transform it into usable knowledge, which truly promotes freedom of learning. Particularly in higher education, where teaching focuses on research-based learning, learners are required to acquire a range of research competencies, including an ability to critically evaluate and assess the credibility and relevance of information. In 2006, the International Federation of Library Associations and Institutions (IFLA) established the IL standards for becoming effective learners, which included three basic components, namely accessing, evaluating and using information. These basic components were later developed into a sequential process, encompassing five key stages: **1) identifying information sources** (recognizing and locating appropriate information pertinent to the identified need); **2) accessing information resources** (effectively and efficiently accessing desired information through various search strategies and information retrieval methods); **3) evaluating information** (critically

evaluating information and its sources for credibility, relevance, and potential bias); **4) applying information** (synthesizing and utilizing acquired information for planning and creating new knowledge); and **5) acknowledging information sources** (employing information ethically, legally, and with respect for intellectual property rights. This process helps learners develop a skillset to seek out valid information and draw conclusion about its details (Seminole State College Library, 2012-2023; Virkus & Nordile, 2013).

Thailand aims to promote the development of IL skills and critical thinking abilities, both of which are considered essential 21st-century skills (Geisinger, 2016). Mae Fah Luang University (MFU), the site at which this study takes place, is likewise committed to the dual aim of developing IL skills and critical thinking, which is the guiding rationale for this study. To this end, the researchers have worked to integrate IL practice into a course called *Digital Media Literacy*, which has been part of the English-major curriculum for undergraduates at MFU since 2022. The incorporation of IL aligns directly with the course's objective of equipping learners with the skills to discern reliable information sources appropriate for both in-class and extracurricular activities; therefore, it makes for a suitable case for implementation of IL, and monitoring and evaluation student development.

Similar initiatives have been implemented at other leading universities in Thailand, such as Mahidol University's "*English for Digital Literacies*" course and Silpakorn University's "*Information Literacy*" course, underscoring the growing recognition of the importance of IL in EFL education across the country (Faculty of Liberal Arts, Mahidol University, 2023; Faculty of Arts, Silpakorn University, 2021). In addition to the core components, the course also emphasizes the systematic and critical evaluation of information sources. To this end, the course utilizes the CRAAP Test, which involves examining the Currency, Relevancy, Authority, Accuracy, and Purpose of information sources (Libraries Central Michigan University, 2010). It is a tool for helping learners to develop skills in evaluating the credibility and reliability of various types of information sources, particularly online data in the "*Evaluating Information*" component of the IFLA processes outlined above.

However, after integrating the IL practice and the CRAAP Test into the *Digital Media Literacy* course for over two years, the instructors reflected that learners were

still struggling to clearly demonstrate their critical thinking and information analysis skills, which are the primary objectives of the course. This was evident through the learners' written work and project presentations, where they exhibited difficulties in applying the CRAAP Test criteria to effectively evaluate the credibility and relevance of information sources. The instructors found that an overwhelming number of CRAAP Test criteria could possibly overload learners' consideration, resulting in a mechanical application for satisfying the assignment criteria rather than as an engaging participatory and meta-cognitive tool (Warner, 2019). As noted in the course's routine evaluation report (TQF5), the instructors recommended reviewing and further developing a clearer understanding of the "*Evaluating Information*" component to engage learners in more in-depth critical analysis with a focus on evaluating authentic information sources such as academic websites and scientific research studies to enhance learners' ability to critically evaluate various information sources. This led to further inquiry into the integration of both concepts, revealing that the key IL components might be too broad in practice, and the application, adaptation, or modification of the strategies used within this implementation is crucial for effectively developing information analysis and critical thinking skills. The ability to evaluate various information sources is a fundamental skill that learners must acquire from classroom instruction to develop themselves as critical thinkers and decision-makers (Kani et al.,2020). However, the process of developing such competencies in learners is a varied and dynamic challenge.

Interestingly, Liu (2021) claimed that incorporating metacognition into IL training and evaluation can enhance learners' self-awareness, making them more conscious of their own thought processes. It empowers learners to become more thoughtful, adaptable, and curious consumers and producers of information. Similarly, Denke, Jarson, and Sinno (2020) studied the promotion of learners' IL development by encouraging metacognitive practice, and they found that a constructivist activity and thematic analysis of learners' responses increased recognition of their IL skills. This approach, through active learning and knowledge construction, allowed learners to demonstrate their IL abilities more clearly as they could recognize the sample actions and strategies that helped them engage in classroom tasks and read critically. Their findings also suggested that adjusting the teaching strategies and scaffolding learners

through constructivist activity, based on their context can increase metacognitive skills, including critical thinking abilities, which ultimately improves their IL. In addition, the metacognitive practice of reflection further reveals learners' evaluation of their own understanding and learning, and gives insight into how they may achieve their learning tasks more effectively. In conclusion, the Denke et al. study highlights the importance of establishing a visible connection between metacognition and IL skills in learners, so that they may explicitly apprehend the methodology and outcome.

In general, formative and summative assessments are used to assess students' cognitive abilities. Notably, summative assessments are given at the end of an instructional period to assess student knowledge through standardized exams, essays, or final projects. However, when assessing student's critical thinking skills with summative assessments, students usually receive only a mark without being allowed to reflect upon their mistakes. In most cases, after an exam, students typically do not have a chance to review their answers or improve their performance, limiting critical reflection and self-assessment. This absence of feedback is a barrier for students to develop essential skills for evaluating their work and making continuous improvements, both of which are vital for lifelong learning (French et al., 2024). On the contrary, formative assessment is considered a more effective approach for fostering critical thinking. Since the nature of formative assessment is conducted continuously throughout the learning process, it enables students to be a part of the learning process with ongoing feedback to reflect on their understanding, make necessary adjustments, and work actively with the content. By allowing students to get involved in their learning through detailed guidance and proper timing, formative assessments deepen students' interest in the subject matter and improve their abilities to analyze, evaluate, and synthesize information more efficiently (Stanley & Moore, 2010).

Therefore, the study aims to promote learners' critical thinking skills and learning experience through the Metacognitive Information Literacy model (MIL). The model integrates the 5 Key Strategies of Formative Assessment (FA) (Leahy et al., 2005) with the 5 key components of IL (Seminole State College Library, 2012-2023). To improve clearer classroom instructions of the "*Evaluating Information*" component, critical reading strategies (Yu, 2015) were integrated with the adaptive CRAAP Test for evaluating the credibility and relevance of information sources. To explore whether

the MIL model with critical perspectives could offer alternatives to learners, we devised the following two research questions:

1. To what extent does the MIL model enhance English-major learners' critical thinking skills?
2. What is the level of learner satisfactions toward using the IL model for enhancing critical thinking skills?

Research Objectives

1. To assess the extent to which the implementation of the MIL model enhances critical thinking skills among English-major learners.
2. English-major learners express satisfaction with the MIL model.

Research Hypotheses

1. English-major learners exhibit an increase in critical thinking skills after the implementation of the MIL model.
2. English-major learners express satisfaction with the MIL model.

Scope of Study

The target population consists of 83 second-year students majoring in English who enrolled in the 1006253 Digital Media Literacy course during the first semester of the 2023 academic year. The participants were capable of reading and writing both Thai and English and were selected through purposive random sampling. Every participant participated in this study voluntarily and anonymously, and they were informed that they could withdraw if they wished. The duration of the study is one semester.

Term and Definition

1) **Information Literacy:** The ability to recognize the need for specific types or characteristics of information, as well as the capability to effectively search for, evaluate the quality of, and utilize the required information.

2) **CRAAP Test:** A set of questions designed to help readers assess the currency, relevance, authority, accuracy and purpose of the information provided by the author.

3) **Critical Reading Strategies:** While the CRAAP Test focuses on evaluating the currency, relevance, authority, accuracy and purpose of the author's writing, critical reading strategies emphasize the reader's understanding of the information being read or selected, as well as a deep comprehension of what the author intends to communicate to the reader.

4) **Five Key Strategies of Formative Assessment**: Important approaches for fostering a positive learning environment in the classroom, which include clarifying, understanding, and sharing learning intentions, engineering effective classroom discussions, tasks and activities that elicit evidence of learning, providing feedback that moves learners forward, activating students as learning resources for one another, and activating students as owners of their own learning.

Chapter 2 Literature Review

Information literacy (IL)

Information Literacy (IL) refers to the ability to access, search, evaluate, and use information effectively. This entails understanding what information is needed and where to find it, as well as making informed judgments about the quality and usefulness of the information (American Library Association, 2000). Julien and Genuis (2011) view IL as crucial for academic success. Individuals with IL skills are those who not only obtain technology skills, but can also analyze, evaluate, and apply IL knowledge to make decisions and to think critically, which are essential in the 21st century. Therefore, developing IL skills is crucial for undergraduates. The Association of College and Research Libraries (ACRL, 2016; Seminole State College Library, 2012-2023) has outlined five standards of IL in higher education that encompass these following components:

1) **Identifying Information**: Information literate individuals should be able to determine the nature and context of information needs and specify the desired information profile.

2) **Finding Information**: Information literate individuals should be able to access information resources with appropriate inquiry and search systems to obtain necessary information.

3) **Evaluating Information**: Information literate individuals should be able to analyze and evaluate selected information and its sources critically, and to efficiently synthesize the selected information into knowledge by summarizing main ideas, applying evaluation criteria, and generating new ideas from existing ones.

4) **Applying Information**: Information literate individuals should be able to You can incorporate collected information with efficiency and judgment to create and communicate ideas effectively.

5) **Acknowledging Information**: Information literate individuals should be able to understand the economic, legal, and social issues related to the use of information and access to and use of information ethically and legally through proper referencing and adherence to copyright guidelines.

Therefore, IL is critically important for university-level learners in this age because many of their assigned tasks such as term papers and project presentations all involve accessing various sources of information to identify information needs, evaluating them critically, applying the information appropriately, and acknowledging the sources of information ethically.

Information Literacy: CRAAP Test

Developed by Sarah Blakeslee in 2004 at California State University (Chico), the CRAAP Test has become a widely adopted tool for teaching critical evaluation of information sources due to its simplicity, adaptability, and effectiveness (Tardiff, 2022). It is also well known for its memorable acronym, which stands for Currency, Relevance, Authority, Accuracy, and Purpose (CRAAP). The convenient packaging of IL concepts makes the CRAAP Test suitable for teaching in diverse contexts and for learning at different levels. Blakeslee (2010) outlines the five criteria as follows:

C-Currency refers to the timeliness of the information, including the publication date and any updates made to the content. It can be assessed by checking for publication and revision dates on websites, ensuring the information is current and up to date.

R-Relevance involves understanding the suitability of the information for the intended purpose and whether it aligns with the student's needs. Factors such as reading titles, introductions, table of contents, or abstracts can help determine relevance, as they provide insight into the content's alignment with the information needs.

A-Authority refers to evaluating the credibility of the information source, considering the qualifications, expertise, and experience of the author or publisher. Indicators of authority include identifying authors of articles or information providers on websites and providing contact information for further inquiries.

A-Accuracy involves the assessment of the reliability and correctness of the information by comparing it with other sources. Questions to consider include whether the content is supported by evidence, has been peer-reviewed, or uses appropriate language for the subject matter.

P-Purpose refers to examining the reason or intention behind the creation of the information, whether it aims to inform, advertise, entertain, sell, persuade, or

provide opinions. Understanding the purpose helps determine how to use the information effectively, such as whether to use it for reference or further research.

Overall, applying the CRAAP Test enables learners or researchers to make informed decisions about the quality and suitability of online sources or various information available online for their academic or research purposes (Esparrago-Kalidas, 2021; Ruleman, Horne-Popp & Hallis, 2017).

Critical Thinking Strategies in IL Classroom Practice

Typically, a class that integrates IL offers learners exercises in critical thinking and processing skills. This is because learners have to go through several stages of IL to find suitable information sources, especially at the *Evaluation* stage or the implementation of the CRAAP test. This IL stage requires analysis, problem-solving, or critical thinking processes to evaluate and choose information sources intelligently. However, in an EFL classroom, learners might not be able to go through these higher-order thinking skills due to difficulties with language comprehension. Metacognitive interventions for language comprehension, such as for text comprehension or for reading skills, is not well understood and needs to be addressed in IL classroom practice (Blummer & Kenton, 2014).

Effective metacognitive instruction: Shifting IL class management from product-oriented to process-oriented

The ideal assessment strategy for IL learning involves administering both formative and summative assessments to engage learners in inquiry and production, allowing them to demonstrate what they know (AASL, 1998). However, when considering the needs of EFL learners, who often face language barriers and cultural differences that necessitate more support and engagement in the learning process, this approach might need to be adapted. EFL learners require more scaffolding and interaction to achieve IL skills, particularly in source evaluation. Focusing on more process-oriented classroom management through formative assessments could be more effective in the EFL context, allowing learners to demonstrate their understanding throughout the learning process (Lam, 2015).

Halpern's (2008) study applied metacognitive strategies emphasizing student assessment in elementary education. By blending collaborative activities and problem-solving tasks into the curriculum, Halpern found that learners exhibited enhanced critical thinking skills and the ability to apply metacognitive thinking strategies in real-life situations. By adapting assessment strategies to the specific needs of EFL learners, instructors can create more effective and supportive learning environments for developing IL skills.

Leahy et al. (2005) proposed a 5 Key Strategies of Formative Assessment (FA) as a framework for implementing effective formative assessment practices that can significantly improve learning outcomes and develop metacognitive skills through learner-focused assessment. In this study, the lesson plan applies the CRAAP Test, emphasizing reading comprehension and analyzing the author's writing. The learning design focuses on critical reading strategies that help students to understand the information they read and to consider what the author intended to communicate. The 5 FA strategies, serving as significant guidelines for supporting this learning objective and creating a conducive learning environment in classrooms including:

1) **Clarifying, sharing, and understanding learning intentions and criteria for success**: Instructors should ensure that learning intentions and success criteria are transparent and understood by learners. A common instructional technique is for the instructor to present learners with multiple work samples of varying quality (such as anonymous examples from a previous year's class). The learners are then asked to rank the samples and start to pinpoint the characteristics that distinguish the higher-performing work from the lower-performing work (William, 2013).

2) **Engineering effective classroom discussions, tasks, and activities that elicit evidence of learning:** Instructors are encouraged to design classroom activities that provide opportunities to engage individual learners, rather than just collect right/wrong answers. Instructors can also use strategies like "hinge point" questions to check on leaners' understanding before continuing the lesson or learning journals, small group work, and pair responses to elicit evidence of learning from all students.

3) **Providing feedback that moves learning forward**: To be effective, feedback needs to promote thinking**.** Instructors should give feedback that is action-

oriented and helps learners understand how to improve. Constructive feedback outlines a series of scaffolded steps to support the learner in reaching the desired goal.

4) **Activating students as learning resources for one another**: Incorporating peer assessment can be valuable as the feedback comes from a peer rather than from someone with authority, allowing the recipient to be more receptive to feedback. The purpose is to improve learning and not to assess for grades. To foster the collaboration, the learning objectives and agreed-upon criteria must be clear to the learners, and the instructors must assist the learners as they learn how to help each other enhance their work.

5) **Activating students as owners of their own learning**: Instructors can help learners develop self-assessment skills with a range of metacognitive strategies, enabling them to regularly plan, monitor, and evaluate their own learning. There should also be frequent opportunities to self-reflect on learning process and to define learning goals. The classroom environment is one that values effort and determination, underscoring the perspective that learning is an ongoing process (William & Leahy, 2015).

The 5 FA strategies unite formative assessment processes with the role of three key agents: teacher, peers, and learners as seen in Figure 1. By implementing these strategies, it is believed that educators can foster a culture of critical thinking and metacognitive practice in the classroom. Each strategy is essential in promoting educators' ability to assess learners during learning, which helps them set learning goals. It also empowers learners as owners of their own learning.

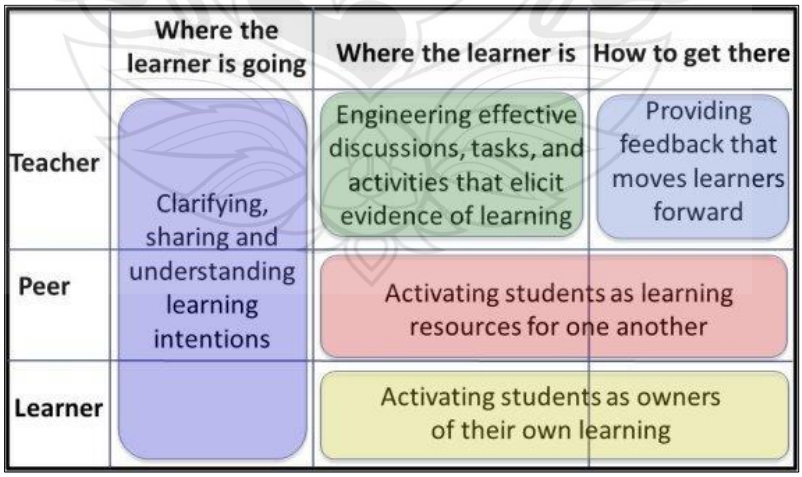

Figure 1: Key Strategies of Formative Assessment (Leahy et al., 2005)

Therefore, placing greater emphasis on learner interaction, with both the instructor and with classmates (especially in Step 3 as seen in Table 1), strengthens learners' understanding of the task during the IL evaluation process. Greater interactivity gives students a chance to exchange ideas and engage in critical thinking skills while working on tasks. Table 1 shows the comparison between a regular IL classroom practice, which is frequently product-oriented, and the metacognitive integration that is more process-oriented. It outlines the steps involved in both approaches and contrasts their strategies.

Table 1: Metacognitive Integration for Shifting to the Process-oriented Class Management

	Former IL Classroom Practice	**Current IL Classroom Practice**
Step 1: Identify Your Topic	Brainstorm and a group discussion	Clarify learning goals and discuss on assessment criteria
Step 2: Find the Information	Practice on keyword strategies individually	Foster effective a classroom discussion on how to access information
Step 3: Evaluate the Sources	Practice on source evaluation for writing an expository essay on Factors that Affect Gender Identity using the **CRAAP** question list individually	- Foster effective a classroom discussion on how to evaluate sources - Empower learners to take ownership of their learning - Activate learners as instructional resources of different arguments and perspectives
Step 4: Apply the Information	Practice creating verbal citation individually	Provide further feedback to advance learners
Step 5: Acknowledge the Originality	Practice on source citations for a written report individually	Provide further feedback to advance learners

Metacognitive intervention: Integrating critical reading strategies into IL classroom practice

When shifting from a product to process-oriented classroom, there should be directed reading strategies deployed when evaluating sources using the CRAAP test.

And meanwhile, teachers provide feedback and strategically prompt students in order to help them perform group discussion.

In terms of critical reading strategies, instructors normally employ pre-while- and post-reading stages in the regular reading classroom. However, when critical thinking is considered, especially when evaluating sources of information in an IL classroom, five critical reading steps (Yu, 2015) should be considered.

1) **Pre-reading**: This straightforward strategy entails quickly scanning the text to find relevant details that support understanding, briefly skimming the text to grasp the overall content and organization, and determining the underlying purpose of the written work.

2) **Reading in context**: In critical reading, the readers' goals are not only to understand the reading material. They engage with the text as if conversing directly with the author. Through this process, they grasp the fundamental meaning of the text and the author's underlying ideas. Critical readers obtain more insights than expected from this kind of engaged reading. Consequently, they develop a profound understanding of the reading material, contingent on the readers' active involvement and relevant background knowledge.

3) **Further the understanding by asking questions and answering them**: Questioning the content is a standard technique employed in reading instruction. Primarily, learners prepare themselves to respond to questions about the text they have read. As learners, they are familiar with teachers asking them questions to evaluate their understanding of the material. These questions are typically designed to help them comprehend and respond to the text more thoroughly.

4) **Further thinking and reflections after reading**: Allowing learners additional time to deliberate and restructure the concepts acquired from the reading material helps develop further understanding of the text after reading.

5) **Outlining and summarizing**: The ability to differentiate between the main ideas, the supporting details and examples is crucial for both outlining and summarizing. The main ideas serve as the foundation that connects various parts of the text together. Outlining the main ideas enables learners to understand the whole structure. Creating an outline is recommended to avoid using the exact wording from the text.

When evaluating sources, interrogating the author's purpose and critiquing the structure of the text are crucial. This exercise enhances text comprehension and allows learners to discuss and determine the text's main idea, and to intelligently determine the text's relevance to their purpose in the class. Utilizing the cognitive domain of Bloom's Taxonomy, particularly the three higher-order skills of analyzing, evaluating, and creating, is beneficial for developing questions aimed at teaching critical reading in EFL classes. This approach aids in planning objectives, formulating questions, and designing assessment items (Anderson et al., 2001). Similarly, the Paul-Elder Model of critical thinking (Paul & Elder, 2006) presents a systematic and hierarchical framework to enhance understanding and foster critical thinking skills. The framework offers learners and instructors a shared vocabulary for defining and implementing critical thinking by outlining 8 Elements of Reasoning. Each of the 8 elements correspond to a category of questions as follows:

1) **Purpose:** Clarify the purpose or goal to understand why critical thinking is necessary and what objectives needs to be achieved;
2) **Question at Issue:** Identify and formulate specific and focused questions that fundamentally require critical thinking;
3) **Information:** Gather relevant and credible information to support one's thinking, involving evaluation and analysis of data;
4) **Inferences:** Interpret information to understand meaning, draw conclusions, and discern significance hidden within the data;
5) **Concepts:** Relate critical thinking to relevant concepts and principles pertinent to the topic under analysis;
6) **Assumptions:** Recognize and acknowledge assumptions, both personal and those of others, as they significantly impact practical thinking;
7) **Implications:** Consider possible outcomes and consequences;
8) **Points of View:** Examine issues from multiple perspectives, understanding and analyzing various viewpoints; and

These elements illustrate how critical thinking analyzes and evaluates the quality of information, investigates questions, and develops personal viewpoints. Synthesizing these two frameworks provide a sophisticated and structured approach for formulating questions that exercise critical thinking skills. Learners have to go through

various types of questions or tasks, which are essential for effective problem-solving, decision-making, and acquiring cognitive processes in various contexts. Learners learn to think and answer numerous questions while reading, which aids them in successfully evaluating the source, which is the primary purpose of critical reading. Table 2 represents the alignment of critical reading strategies with Bloom's Taxonomy and the Paul-Elder Critical Thinking models in IL classroom management. This integration illustrates the enhanced depth and breadth of learning experiences produced by the metacognitive intervention, which utilizes guided questions during the administration of the CRAAP test.

Table 2: Comparison between Former IL classroom Practice and a Metacognitive Intervention

<table>
<tr><th rowspan="2">Former IL Classroom Practice</th><th colspan="2">Current IL Classroom Practice</th></tr>
<tr><th>Critical Reading Strategies</th><th>Bloom's Taxonomy and the Paul-Elder Critical Thinking Models</th></tr>
<tr><td colspan="3">Step 1: Identify Your Topic</td></tr>
<tr><td colspan="3">Step 2: Find the Information</td></tr>
<tr><td rowspan="3">Step 3: Evaluate the Sources
No specific reading strategies
CRAAP Test</td><td>Pre-reading
- Predicting</td><td>What patterns of text organization are used?</td></tr>
<tr><td>While-reading
- Reading in context: CRAAP Test
- Questions generating: Further the understanding by asking questions and answering them</td><td>What is the overall main idea of the text?
Is the information fact or opinion-based? How do you know? Please give an example from the text.</td></tr>
<tr><td>Post-reading
- Clarifying: Further thinking and reflections after reading
- Summarizing: Outlining and summarizing</td><td>Is the overall information convincing? Why or why not?
Would you choose this text as a source of information?
What can be concluded from the information?</td></tr>
<tr><td colspan="3">Step 4: Apply the Information</td></tr>
<tr><td colspan="3">Step 5: Acknowledge the Originality</td></tr>
</table>

Previous studies on meta-cognitive strategies in IL

Metacognitive strategies aimed at promoting student learning assessment, as proposed by Leahy et al. (2005), have been widely implemented in educational contexts and with learners of various ages, demonstrating their effectiveness in fostering critical thinking skills. For instance, Ennis and Millman (2005) conducted research in philosophy courses at the university level, integrating metacognitive strategies focused on student assessment into classroom discussions. The results show that learners who underwent this method developed analytical thinking skills crucial for decision-making in their future learning and work environments. Halpern's (2008) study also applied metacognitive strategies emphasizing student assessment in elementary education. By blending collaborative activities and problem-solving tasks into the curriculum, Halpern found that learners exhibited enhanced critical thinking skills and the ability to apply metacognitive thinking strategies in real-life situations. Halpern recommended integrating metacognitive strategies into primary and secondary education, enabling educators to design teaching plans that promote learners' ability to analyze, evaluate, and synthesize information, encouraging independent thinking, problem-solving skills, and readiness to inquire, verify, and construct knowledge autonomously.

The information gathered in the literature reveals a strong correlation between several vital elements. Information Literacy (IL) is critical. Students need to develop the capacity to detect the characteristics of information for which they are searching. They need to be adept at searching, evaluating, and leveraging such information efficiently. Complementing IL is the CRAAP Test, enabling students to demonstrate their insight into the quality and appropriateness of online sources for academic purposes. Moreover, critical reading strategies play an essential role, emphasizing a deep understanding of selected information and the genuine intentions of the authors through techniques like pre-reading, contextual comprehension, questioning, reflection, and summary. Additionally, the 5 Key Strategies of Formative Assessment (FA) signal a shift in classroom management from a product-oriented to a process-oriented approach, fostering an environment conducive to learning.

These strategies, which include setting learning objectives, facilitating discussions, offering feedback, promoting peer collaboration, and empowering student autonomy, have all been shown to enhance critical thinking skills significantly.

Therefore, integrating the ideas of metacognitive approaches and critical reading processes into the IL process as seen in Figure 2 nurtures independent thinking, problem-solving abilities, and the capacity to construct knowledge autonomously.

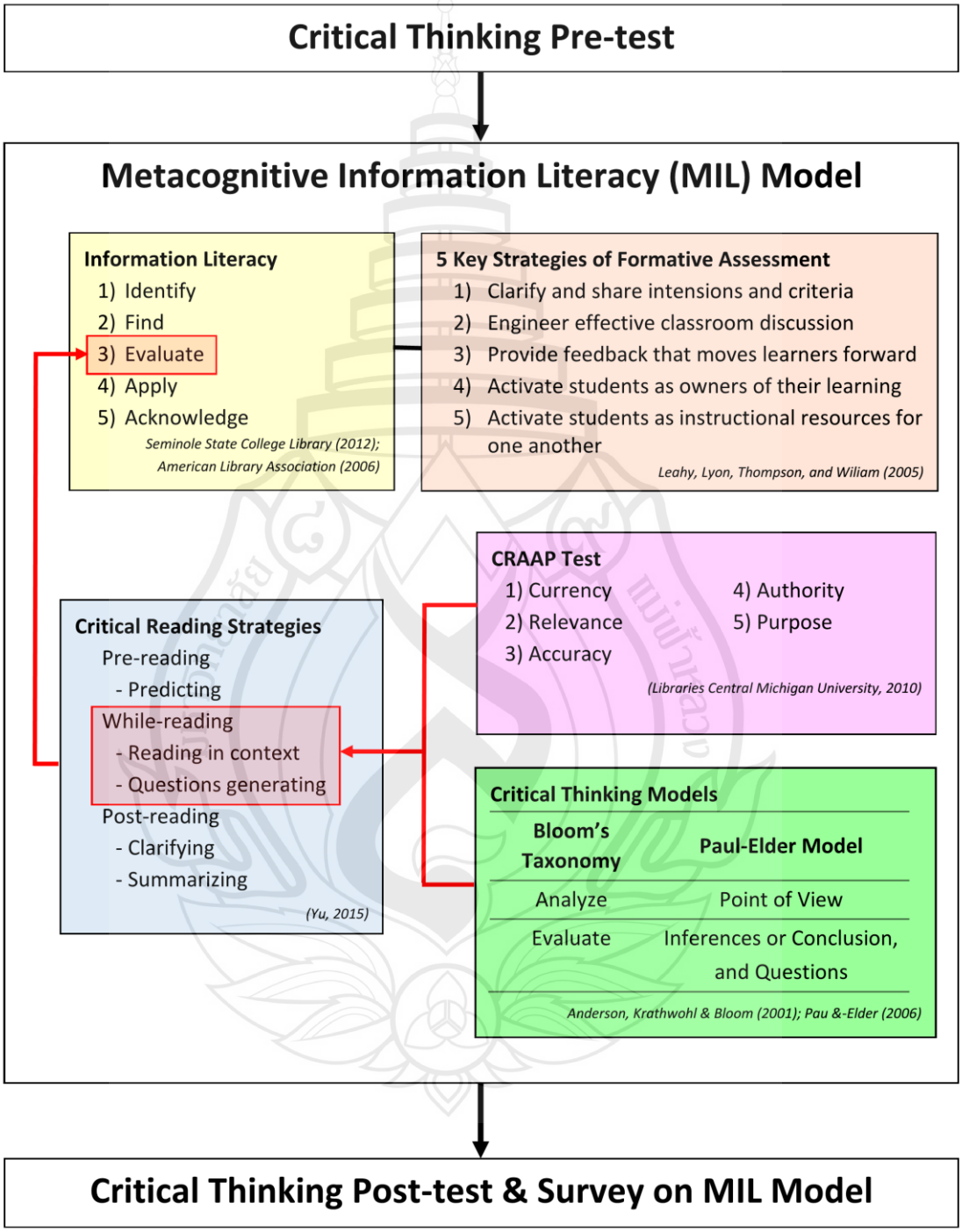

Figure 2: Framework of the Study

Chapter 3 Research Methodology

This section explains the quantitative research design, including the characteristics of the participants, the development and validation of the research instruments, data collection procedures, and statistical analysis. The focus is on the pre- and post-intervention assessment of critical thinking skills and satisfaction with the MIL model.

Research Design

This study employed a one-group pre- and post-test with purposive sampling to comprehensively investigate the effectiveness of the Metacognitive Information Literacy (MIL) model in enhancing participants' critical thinking abilities and their satisfaction with the model. In the initial stage, a pre-test was administered to establish a baseline for the participants' critical thinking skills. The pre-test was designed by integrating Bloom's taxonomy and the Paul-Elder Critical Thinking model, allowing the researchers to assess the participants' capacity to critically engage with a given text. The MIL model was then implemented. This model incorporates the Information Literacy (IL) components with the metacognitive practice through the Five Key Strategies of Formative Assessment (FA), along with critical reading strategies and the CRAAP test, offering a structured yet engaging approach to improving critical thinking competencies. After the intervention, the participants underwent a post-test to evaluate the immediate outcomes and the alignment of the model with essential critical thinking skills. Additionally, a satisfaction survey was administered to gather feedback from the participants on the model. The survey covered areas related to the Five FA strategies, such as engagement in classroom discussions and satisfaction with feedback and collaborative activities. The study took place over approximately four months.

Participants

This quantitative research was conducted at the School of Liberal Arts, Mae Fah Luang University in Thailand. The participants were 83 English-major undergraduates who enrolled in the *1006253 Digital Media Literacy* course in the first semester of

2023. Students at this level are capable of reading and writing both Thai and English. The participants were selected through purposive random sampling. Every participant participated in this study voluntarily and anonymously, and they were informed that they could withdraw if they wished.

Research Instruments

Three main instruments for the MIL model implementation and data collection were used in the study, namely the MIL model, the critical thinking pre- and post-test, and the satisfaction survey. More detail is provided as follows:

1) MIL Model Development

Before developing the MIL model, the content and learning outcomes of the *Digital Media Literacy* course were reviewed. To equip the participants with enhanced critical thinking abilities, the model was developed through a comprehensive review process. The model integrated key components from various frameworks as shown in Figure 2. By combining these elements, the MIL model emphasizes reflection and critical thinking in classroom practice. The teaching instructions were then carefully designed to align with each stage of the model, ensuring a seamless integration of the various components and a consistent focus on developing critical thinking skills. Table 3 illustrates the implementation of selected frameworks that pertain to critical thinking skills within the course.

Table 3: MIL Model

5 Components of Information Literacy	Intervention of 5 FA Strategies, Critical Reading Strategies & CRAAP Test in the Teaching Instructions
Class 1 Identify: Task - Recognize the task, information need, purposes of information	**Clarify and share intentions and criteria** - Classroom discussion to clarify the learning goal of the assigned task. - Work samples circulation to establish success criteria and prompt a discussion about quality.
Class 2 Find: Task - Find needed information effectively and efficiently	**Engineer effective classroom discussion** - Exit Passes to review and use the responses to shape the next lessons. **Activate students as instructional resources for one another** - A small group activity to share and propose effective searching techniques.

5 Components of Information Literacy	Intervention of 5 FA Strategies, Critical Reading Strategies & CRAAP Test in the Teaching Instructions
Class 3 Evaluate: Task - Analyze and evaluate information and its sources critically	**Critical reading skills for information selection** - Reading comprehension questions to summarize main ideas and evaluate an argument of the assigned reading. - CRAAP Test to evaluate academic and non-academic sources. **Activate students as owners of their learning** - A self-regulated task to further the source evaluation.
Class 4 Evaluate: Task - Share information and its sources critically	**Engineer effective classroom discussion** - General critical reading questioning to encourage brainstorming and sharing about how to evaluate the assigned information sources. **Activate students as instructional resources for one another** - A small group discussion to share and give feedback to each other.
Class 5 Apply: Task - Integrate information and a direct quotation from sources into an oral presentation	**Provide feedback that moves learners forward** - A small group activity to share ideas of the project and receive some detailed comments from the instructor.
Class 6 Acknowledge: Task - Cite an information source in the written report	**Provide feedback that moves learners forward** - Turnitin program to receive constructive feedback on grammatical usage of their report. - Written feedback on content development from the instructor.

2) Critical Thinking Pre-test and Post-test Design

The critical thinking pre-test and post-test were administered to assess changes in participants' critical thinking abilities before and after using the MIL model. The test featured two sets of a reading passage and ten questions that assessed higher levels of critical thinking skills. Some questions were adapted from the CRAAP test, as the participants were set to encounter the question sets through the MIL model. For each question, the participants were asked to write responses in English. The test was administered in a print format, and the time taken to complete the test was recorded.
Connections of Critical Thinking Levels

Table 4: Connections of Critical Thinking Levels

Bloom's Taxonomy	Paul-Elder Model	Critical Thinking Pre-Posttests	
Analyze	Point of View	**Analysis Asks:** Q1. Text Organization Q2. Main Idea	**Interpretation Asks:** Q3. Author's Point of View Q4. Fact VS Opinions
Evaluate	Inferences or Conclusion, and Questions	**Evaluation Asks:** Q5. Conclusion Q6. Reference Q7. Argument	**Information Literacy Asks:** Q8. Validation Q9. Selection Q10. Judgment

In the test, the critical thinking skills assessed started at the level of *Analyze*, which is considered the critical thinking stage of Bloom's Taxonomy (Adams, 2015). The first two questions ("Analysis Asks") focused on analyzing the text organization and the overall main idea. Similarly, questions 3 and 4 ("Interpretation Asks") were aimed at assessing learners' abilities to distinguish between facts and opinions, as well as to identify the author's point of view. Next, learners were assessed on their interpretation of inferences, conclusions, and arguments drawn from the passage in questions 5 to 7 ("Evaluation Asks"). Finally, questions 8 to 10 ("Information Literacy Asks") required learners to present and defend opinions by making judgments about information, the validity of ideas, or the quality of work based on the criteria in the questions.

The same test was administered before and after the intervention. To evaluate the content validity and reliability of the test, three experts in English instruction were asked to complete evaluation forms to determine the index of Item-Objective Congruence (IOC). Items with an IOC index greater than 0.50 were considered valid, while those below this standard were modified based on the experts' feedback. The reliability analysis result of the test was 0.963, indicating high reliability. Even though the test can be considered valid overall, some items were modified based on the experts' feedback to ensure accuracy and consistency.

3) Participants' Satisfaction Survey

The satisfaction survey consisted of 11 items, all scored on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The survey was administered online through a Google Form with five main sections based on the Five Key Strategies of Formative Assessment (FA) to investigate learning experience through teaching instructions that aim to foster a cooperative learning environment and promote metacognition. The first section focuses on learners' experiences with the "Clarify and Share Intentions and Criteria" strategy, the second section questions their perceptions toward the "Engineer Effective Classroom Discussion" strategy, and the third section asks for feedback on the "Provide Feedback that Moves Learners Forward" strategy. The fourth section consists of two questions regarding the "Activate Students as Owners of Their Learning" strategy, and the final section asks participants to reflect on their experiences with the "Activate Students as Instructional Resources

for One Another" strategy. The survey also included an open-ended section, allowing participants to provide additional comments or suggestions. This enabled the researchers to gather more comprehensive feedback on the learners' experiences and the overall impact of the model.

In order to evaluate the content validity and reliability of the survey, three experts in English instruction were asked to complete evaluation forms to determine the index of Item-Objective Congruence (IOC). Items with an IOC index greater than 0.50 were considered valid, while those below this standard were modified based on the experts' feedback. The reliability analysis result of the survey was 0.934, indicating high reliability. Even though the survey can be considered valid overall, some items were modified based on the experts' feedback for accuracy and consistency.

Data Collection

This quantitative study targeted a specific group of participants, collecting scores from pre- and post-intervention tests and satisfaction surveys. The data collection process began on the 1st week of the course, when the critical thinking pre-test was administered to measure the participants' critical thinking abilities prior to the intervention of the MIL model. The time allocation for completing the pre-test in the classroom was about 2 hours.

The MIL model interventions were implemented across two distinct course periods: one before a formative assessment and another before a summative assessment. The first intervention was designed to introduce participants to the model's structure and teaching instructions, so to familiarize them with the key components. This initial phase aimed to lay the groundwork for developing critical thinking skills. The second intervention, on the other hand, was intended to reinforce the learning process and solidify the model's application. By revisiting the strategies and activities at this stage, the researchers sought to strengthen the participants' ability to critically engage with the course content. All of the specific intervention procedures, including the teaching instructions and activities used to enhance critical thinking skills, are presented in the following table.

Table 5: The interventions of the MIL Model

Weeks 2 – 7 1st Intervention	Week 2 - **Identify**: Classroom discussion on understanding university's assignments and choose a topic with suitable types of information for the 20% Individual Assignment
	Week 3 – **Find:** Exit Passes to review effective use of keyword techniques and university's library resources to locate needed information for the 20% Individual Assignment
	Week 4 - **Evaluate:** Answering critical reading questions and CRAAP Test to discern false, biased information and analyze information sources for the 20% Individual Assignment
	Week 5 - **Evaluate:** Sharing individual analysis based on the self-regulated task in a 30-minute group discussion on analyzing information sources and evaluating the arguments of others.
	Week 6 - **Apply:** Sharing progress of the 20% Individual Assignment and gain feedback on in-text citations in oral presentation from the instructor
	Week 7 - **Acknowledge:** Integrating *Turnitin* program to gain feedback on grammatical usage of the 20% Individual Assignment report and gain feedback on content development from the instructor
Week 10 – 15 2nd Intervention	Week 10 - **Identify:** Classroom discussion on understanding the 50% Final Project and choose a topic with suitable types of information
	Week 11 - **Find:** Sharing and proposing effective searching techniques in a small group discussion for the 50% Final Project
	Week 12 - **Evaluate:** A self-regulated task to further the source evaluation through critical reading questions and CRAAP Test to discern false, biased information and analyze information sources for the 50% Final Project
	Week 13 - **Evaluate:** Sharing individual analysis based on the self-regulated task in a 30-minute group discussion on analyzing information sources and evaluating the arguments of others
	Week 14 - **Apply:** Sharing progress of the 50% Final Project and gain feedback on in-text citations in oral presentation from the instructor
	Week 15 - **Acknowledge:** Integrating *Turnitin* program to gain feedback on grammatical usage of the 50% Final Project presentation and gain feedback on content development from the instructor

On the 16th week, the participants took the critical thinking post-test, which was identical to the pre-test, at the end of the class with the same time allocation, and an additional 30 minutes was given for completing the satisfaction survey. By comparing the scores of the pre- and post-tests, the researchers were able to determine whether there was an improvement in the participants' critical thinking skills due to the MIL model intervention.

Data Analysis

In the data analysis and interpretation phase, the researchers utilized two primary data sources: the critical thinking pre- and post-tests and the satisfaction survey. The results from the pre-posttests provided a comprehensive assessment of how the MIL model influenced the participants' critical thinking skills. Descriptive statistics of these test scores were analyzed using the SPSS program, which calculated the mean, standard deviation, and probability value (p-value) for determining the statistical significance of any observed improvements. To analyze the data from the satisfaction survey, the researchers employed arithmetic means to interpret the ratings on a 5-point scale are as follows:

- 4.50-5.00 indicates the highest satisfaction,
- 3.50-4.49 indicates high satisfaction,
- 2.50-3.49 indicates moderate satisfaction,
- 1.50-2.49 indicates low satisfaction,
- 1.00-1.49 indicates the lowest satisfaction.

This allowed us to gauge the participants' overall level of satisfaction with the model and its implementation. By combining the quantitative data from the pre-posttests and the satisfaction survey, the researchers were able to develop a well-rounded understanding of the model's impact on critical thinking skills and the participants' perceptions of its effectiveness.

Chapter 4 Research Results

This study investigates the effectiveness of the Metacognitive Information Literacy (MIL) model in enhancing EFL learners' critical thinking abilities and their satisfaction with the model. The model incorporates enhanced features of the traditional information literacy components with the inclusion of the formative assessment strategies, critical reading strategies and the CRAAP test for evaluating information sources. The following section presents the results of the pre- and post-test on students' critical thinking skills and their satisfaction with the MIL model.

RQ1: To what extent does the MIL model enhance English-major learners' critical thinking skills?

This section includes quantitative analysis of pre- and post-test scores, showing a statistically significant increase in critical thinking skills. Table 6 below shows the effectiveness of the MIL model in enhancing students' critical thinking.

Table 6: Pre-posttest on learners' critical thinking skills

Group	Participants (n=83)	p-value
	$\bar{x}$ (*SD*)	
Pre-test	40.41 (10.9)	.000*
Post-test	52.77 (8.73)	

When comparing the pre-test ($\bar{x}$ = 40.41, S.D. = 10.9) and the post-test ($\bar{x}$ = 52.77, S.D. = 8.73) scores (see Table 6), the difference in critical thinking skills is statistically significant (t (82) = 12.42, p<.000). This reveals that the MIL model intervention enhanced the participants' critical thinking skills. This proves that students think more critically after receiving the treatment of the Metacognitive Information Literacy model.

The results also imply that educators who aim to develop EFL learners' critical thinking skills may find the MIL model helpful due to its enhanced features of the five regular information literacy components. These enhanced features include the critical

reading strategies and the CRAAP test in the evaluation stage, as well as the Five Key Strategies of Formative Assessment (FA) embedded in all five stages of the IL components. These enhancements have facilitated learners' discussions, interactions, and collaborations with classmates and instructors, which is essential for cognitive achievement as show in Figure 3.

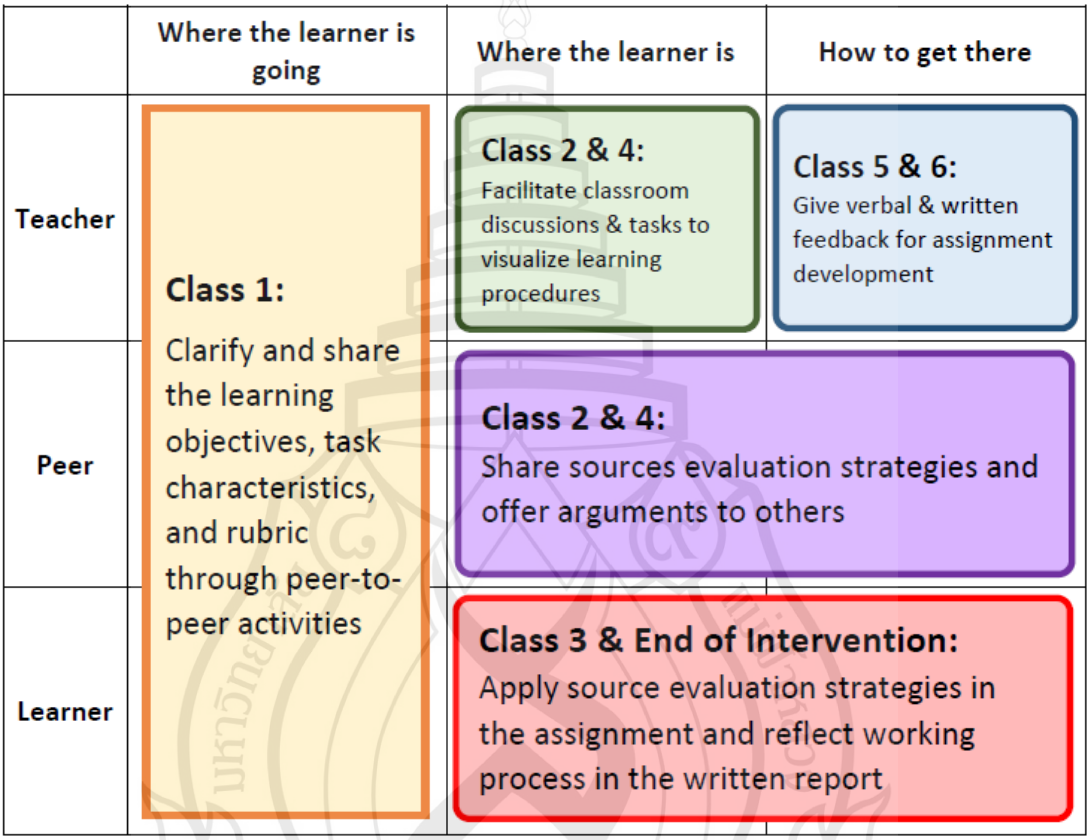

Figure 3: The Enhancement of MIL Model

Learners were informed at the beginning of the course about the objectives and assessments by which they would be evaluated during each stage of the process. This was to ensure that they are on the right path and to know their strengths as well as areas for improvement. After learners have gone through all five stages, they can then identify, find, and evaluate the information, and make intelligent decisions about the sources of information that they intend to use for a particular topic. This is evidence of learners developing and applying critical thinking skills due to the added features of the MIL model. It is also reflective of a deliberate shift away from an emphasis on summative assessment to formative procedures while experiencing the model.

RQ2: What is the level of learner satisfactions toward using the IL model for enhancing critical thinking skills?

The section addressing RQ2 provides findings on student satisfaction with the model, using results from a structured satisfaction survey.

Table 7: Survey on learners' satisfaction with the MIL model

Item	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)	Mean ($\bar{x}$)	SD
1. Clarifying and Sharing Intentions and Criteria							
1.1 You felt that the objectives of the course were clearly communicated to you.	0	0	9	27	47	4.07	0.56
1.2 You understood what was expected of you in terms of learning outcomes and assessment criteria.	0	0	11	17	55	4.13	0.58
2. Engineering Effective Classroom Discussions							
2.1 Your participations in discussions were valuable.	0	0	2	24	57	4.25	0.50
2.2 You felt encouraged to share your ideas and opinions during discussions.	0	0	0	14	69	4.41	0.50
2.3 You found these discussions engaging and relevant to the subject matter.	0	0	2	17	64	4.33	0.53
3. Providing Feedback that Moves Learners Forward							
3.1 You received timely and constructive feedback on your assignments and assessments.	0	0	4	19	60	4.26	0.54
3.2 The feedback helped you understand your strengths and areas for improvement.	0	0	3	20	60	4.27	0.52
4. Activating Learners as Instructional Resources for One Another							
4.1 You were allowed to collaborate with your peers for group projects or study sessions.	0	0	0	16	67	4.38	0.49
4.2 You found these collaborative	0	0	7	25	51	4.13	0.66

Item	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)	Mean ($\bar{x}$)	SD
experiences beneficial in enhancing your understanding of the subject matter.							
5. Activating Learners as Owners of Their Learning							
5.1 You felt that you had autonomy over your learning process.	0	0	6	24	53	4.16	0.64
5.2 When doing assignments, you were able to set personal learning goals and engage in activities that matched your interests and learning style.	0	0	7	24	52	4.14	0.64

Table 7 presents the survey results of 83 participants who rate their level of satisfaction with the MIL model. Most participants strongly agreed that the model effectively achieved several functions. These include clarifying the intentions and objective criteria, provoking effective classroom discussions, providing feedback that moves learners forward, activating students as instructional resources for one another, and empowering students as owners of their learning. Regarding the items related to classroom discussion, most participants agreed that the model effectively engineered practical classroom discussions, and their participation in discussions was valuable (mean = 4.25). They felt encouraged to share their ideas and opinions during discussions (mean = 4.41), and they found them to be engaging and relevant to the subject matter (mean = 4.33).

Chapter 5 Research Discussion

Integrating metacognitive practice through the Five Key Strategies of Formative Assessment (FA) along with critical reading strategies and the CRAAP test builds a strong bond between several vital elements in the IL components. The MIL model has proven to develop learners' cognitive skills, resulting in the development of critical thinking skills in four key ways.

First and foremost, learners could detect the characteristics of information needed for the task, and they developed an ability to search, evaluate, and leverage such information efficiently. It fosters learners' skills in identifying, finding, evaluating, applying, and acknowledging relevant information. This is considered a baseline for the analytical skills necessary for critical reading and metacognitive strategies, thus serving as an essential skill for EFL learners learning in the modern era (Blummer & Kenton, 2014).

Secondly, learners demonstrated insight and understanding of the quality and appropriateness of online sources for academic purposes (Kani et al., 2020). The addition or modification of strategies within the IL framework of the CRAAP test, according to learners' circumstances and context, such as the added criterion for metacognition by Tardiff (2022) in a new set of CRAAP criteria, helped learners think critically and enhanced their metacognition, resulting in improved information literacy awareness.

Thirdly, learners achieved a depth of understanding of the selected information and could interpret the genuine intentions of the writers. This was shown through techniques like outlining and summarizing the main idea, analyzing the author's point of view, evaluating the author's facts and opinions in an argument, and drawing conclusions from the reading texts. These skills are a frequent crutch for EFL learners, and this model demonstrates some promising results for facilitating the improvement of learners' critical thinking.

Fourthly, shifting from a summative to a formative assessment approach fosters a cooperative learning environment conducive to constructing knowledge. These strategies, which encompass emphasizing learning objectives, facilitating classroom

discussions, offering peer feedback, promoting group work collaboration, and empowering individual student autonomy (Leahy et al., 2005) are all valued by students, as shown in the satisfaction survey. The model effectively facilitated classroom discussions throughout the IL process, as it embedded group, peer, and teacher discussion activities, allowing learners to take on various roles and work in their individual tasks. Learners appreciated timely and constructive feedback and found it helpful for understanding their strengths and areas for improvement. They acknowledged their role in peer collaboration and group projects in enhancing understanding and critical thinking. They also felt a sense of autonomy over their learning process and could set personal learning goals. This is important as learners are expressing a desire to construct knowledge and understanding independently, and to engage in discussion with the teacher and peers. In other words, students do not want instructions to follow, but actually appreciate the critical thinking process.

In summary, integrating the ideas of the CRAAP test, metacognitive practices, and critical reading processes into the IL components effectively nurtures independent thinking through critical reading assignments, problem-solving abilities through group discussions, and the capacity to construct knowledge autonomously via the term project, thus preparing EFL learners for success in critical thinking within the IL context.

Conclusion and Implications

In conclusion, the MIL model significantly improves EFL learners' critical thinking skills. This model provides educators and instructional designers with a critical thinking skills development framework by integrating metacognitive practice, critical reading strategies, and the CRAAP test.

Practical Implications for Educators and Instructional Designers

For educators, this study offers a combination of a learning tool set from the IL model, the CRAAP Test, and the 5 Key Strategies of Formative Assessment (FA) for Higher Education EFL learners. The study highlights the importance of learners' involvement in their learning and responsibility for their learning process, as well as the scaffolding from peers and teachers in the classroom through a toolset that develops

their metacognition. The process underneath the IL model strengthens students' metacognition while interacting with the teacher and peers, for it synthesizes various strategies for critically evaluating information. Moreover, the study has also shown that summative assessment tasks alone are inadequate for metacognitive development. Educators and instructional designers should apply group activities, instructions, scenarios, or individual assignments such as the ones integrated into this study for developing EFL learners' cognitive and metacognitive skills. Students obtain skills in evaluating online sources and materials for their classroom assignments, and it sets them up to be lifelong learners.

Additionally, educators and instructional designers may find the pre- and post-test and metacognitive information literacy satisfaction survey beneficial in evaluating learners' critical thinking skills development and satisfaction with the formative assessment process, although it will need adaptation to fit the unique needs of their students and context.

Limitations and Areas for Future Research

While this study contributes to improving critical thinking skills in the EFL context, its first limitation is the research design. This study was implemented with one group of learners using a one-group pre-and post-test purposive sampling research design. Therefore, future research could compare the MIL model with the regular IL components or other models using a true experimental research design. This would ensure that the teaching practices are constantly evolving to be process-oriented, constructivist, and encouraging of collaborative learning.

Moreover, our context was limited to the IL course for higher education; therefore, future research could explore or implement the model in other courses, such as a research and seminar course for either undergraduate or graduate students, or some other non-degree course, evaluating the critical thinking skills for learners of different levels and disciplines. Addressing these aspects will help to refine and broaden the pedagogical role of the MIL model in education.

Additionally, the MIL model has certain limitations regarding its scope and technology integration that require attention. While it aims to enhance critical thinking and digital literacy, it may not fully accommodate the fast-evolving digital

environment. The model needs to adapt and include emerging digital trends, which might better its relevance and effectiveness. Moreover, the model may lack flexibility in accommodating diverse cultural and local contexts. Therefore, the model might be adjusted so it can reflect cultural variance in information processing and media consumption for its wider applicability.

Another limitation of this study is that it solely rests on quantitative research methods. While quantitative data provides certain important statistical information, this kind of data, at times, is missed with respect to subtle perspectives and subjective experiences of participants. It would be more holistic to integrate qualitative approaches, such as in-depth interviews or focus groups, into this subject matter. This would not only deepen the findings but also enrich the investigation of participants' underlying motivations, attitudes, and the contextual factors that shape their responses. Qualitative dimensions may be incorporated in future studies as one way to enhance validity and applicability by offering a more holistic view of the investigated topic.

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Appendix

Pre and Post-test

Instructions:

1. Read the given situation

> In your English Reading and Writing 1 course, you are assigned to write an expository essay about polar bears conservation. You are required to explain possible ways to conserve polar bears while giving examples of each possibility. Even though this course is a beginning level, but your instructor requires you to support your points with solid evidence of scholarly reviewed information.

2. Read Passage 1 and 2 provided below. After reading the passage, answer the questions that follow (questions 1-20) based on your understanding of the given situation and reading texts. Your responses will be evaluated based on the accuracy and clarity of your answers. Make sure to provide relevant explanations and examples from the text to support your answers. Your answers should reflect your comprehension of the passage and your ability to analyze its content.

Passage 1: The Imperative to Safeguard Polar Bears (Questions 1 – 10)

The plight of polar bears is dire due to climate change, and their extinction could yield far-reaching consequences. Adapted to endure the harsh Arctic environment, polar bears' survival hinges on unique attributes, including substantial fat layers. These attributes seem to shield them from health issues linked to obesity, a contrast to humans.

A 2014 study by Shi Ping Liu and colleagues uncovered genetic insights. Comparing polar bears' DNA to warmer-climate brown bears, researchers identified the APoB gene responsible for managing 'bad' cholesterol. This revelation might offer insights into human heart health.

Polar bear genes might also unlock solutions for osteoporosis, a disease particularly affecting the elderly. Astonishingly, pregnant bears enhance bone density before hibernation, as proposed by Alanda Lennox and Allen Goodship in 2008. This discovery could revolutionize bone ailment treatments.

However, the significance goes beyond utility. Empathy should extend to these agile problem-solvers. Despite prevailing misconceptions, anecdotal evidence

suggests polar bears possess intellect and emotions. This challenges stereotypes and underscores their value beyond research.

Their emotional spectrum is complex. These giants display frustration and form unique bonds, like Agee's close rapport with Mark Dumas. Losing polar bears to climate change would mean not just the forfeiture of medical prospects but also the vanishing of a magnificent and intelligent species.

Question 1-10 (10*5 = 50 marks)

1. What modes of analysis/pattern of text organization are used (e.g. illustration, comparison/contrast, cause and effect, process analysis, classification/division, definition)?

   _____

2. What is the overall main idea of the passages 1?

   _____

3. What it the author’s point of view toward the main idea of passage 1?

   _____

4. Is the passage fact or opinion-based? How do you know? Please give one example from the text.

   _____

5. What can be concluded from the passage 1?

   _____

6. Are referred researches in the passage 1 reliable? How can evaluate their credibility?

   _____

7. Is the argument logically consistent? Why or why not?

   _____

8. Is the overall information of passage 1 convincing? Why or why not?

   _____

9. If you want to explore more about the credibility of the referred researches, what information will you use as keywords to further your search?

   _____

10. If you were to incorporate information for the given situation, would you choose this passage as a source of information? Why or why not?

_____

<u>Passage 2</u>: The Urgent Need to Preserve Polar Bears in the Face of Climate Change (Questions 11 – 20)

The plight of polar bears, driven to the brink by climate change, serves as a chilling harbinger of the broader ecological cataclysm. Their impending extinction isn't just a loss of a species; it's a grim testament to our recklessness.

These Arctic titans, uniquely evolved to navigate the unforgiving icy expanses, embody nature's steadfast resilience. Their survival secrets, like the insulating fat layers that defy the cold, unravel evolution's brilliance in its purest form.

In a scientific coup, a 2014 study revealed genetic treasures, offering insights beyond polar bear longevity. The APoB gene, a player in cholesterol dynamics, could potentially unlock not only their endurance but also offer a glimpse into safeguarding human hearts.

Yet, they're more than biological goldmines. Polar bears hold emotional mirrors, reflecting intelligence and connections. Stories of frustration and friendships with other species rewrite our assumptions. These narratives are fragments of a rich emotional tapestry beyond our species.

A world stripped of polar bears wouldn't just erase a link to genetic revelations; it would silence a chapter narrating the wonders of the natural world. Preserving them isn't a choice dictated by utility alone; it's an ode to the symphony of life itself, where every species has a voice, a role, and a right to endure.

Question 11-20 (10*5 = 50 marks)

11. What modes of analysis/pattern of text organization are used (e.g. illustration, comparison/contrast, cause and effect, process analysis, classification/division, definition)?

_____

12. What is the overall main idea of the passages 1?

_____

13. What it the author's point of view toward the main idea of passage 1?

_____

14. Is the passage fact or opinion-based? How do you know? Please give one example from the text.

_____

15. What can be concluded from the passage 1?

_____

16. Are referred researches in the passage 1 reliable? How can evaluate their credibility?

_____

17. Is the argument logically consistent? Why or why not?

_____

18. Is the overall information of passage 1 convincing? Why or why not?

_____

19. If you want to explore more about the credibility of the referred researches, what information will you use as keywords to further your search?

_____

20. If you were to incorporate information for the given situation, would you choose this passage as a source of information? Why or why not?

_____

Rubric

Criteria	Exceptional (5)	Proficient (4)	Adequate (3)	Developing (2)	Limited (1)
Analysis Asks (Questions 1 & 2)	Demonstrates a thorough understanding of the modes of analysis and accurately identifies the main idea.	Accurately identifies the modes of analysis and main idea, showcasing a good understanding.	Identifies the modes of analysis and main idea, but with minor inaccuracies.	Partially identifies the modes of analysis and main idea, with significant gaps in understanding.	Fails to identify the modes of analysis and main idea, displaying a lack of comprehension.
Interpretation Asks (Questions 3 & 4)	Provides a nuanced understanding of the author's point of view and effectively differentiates between fact and opinion.	Presents a clear understanding of the author's point of view and distinguishes between fact and opinion.	Identifies the author's point of view and recognizes the distinction between fact and opinion, with minor inconsistencies.	Demonstrates a basic understanding of the author's point of view and fact/opinion differentiation, but with limited depth.	Struggles to grasp the author's point of view and lacks clarity in discerning fact from opinion.
Evaluation Asks (Questions 5, 6 & 7)	Offers insightful conclusions drawn from the passage and effectively evaluates the reliability, logical consistency, and persuasiveness of the argument.	Presents well-reasoned conclusions and evaluates the reliability, logical consistency, and persuasiveness of the argument.	Provides adequate conclusions and evaluates some aspects of reliability, logical consistency, and persuasiveness, with minor gaps.	Offers basic conclusions and provides limited evaluation of reliability, logical consistency, and persuasiveness.	Provides vague or unclear conclusions and lacks substantive evaluation of reliability, logical consistency, and persuasiveness.
Information Literacy Asks (Questions 8, 9 & 10)	Demonstrates a comprehensive understanding of how to evaluate research credibility and identifies reputable sources for further exploration. Presents a clear rationale for choosing to cite or not cite the passage.	Displays a good understanding of evaluating research credibility and identifying reputable sources, along with a reasonable rationale for citation choices.	Exhibits a basic understanding of evaluating research credibility and identifying reputable sources, with minor gaps. Provides a limited rationale for citation choices.	Demonstrates a limited understanding of evaluating research credibility and identifying reputable sources, with significant gaps. Offers a weak or unclear rationale for citation choices.	Lacks a meaningful understanding of evaluating research credibility and identifying reputable sources. Fails to provide a rationale for citation choices.

Total 100 marks

Index of Item – Objective Congruence: IOC

Pre and Posttest

Expert name: _____

แบบประเมินความเที่ยงตรงเชิงเนื้อหา (Content Validity) และความเชื่อมั่นของแบบทดสอบ (Reliability) สำหรับเครื่องมือที่จะใช้ในงานวิจัยเรื่อง

Development of Metacognitive Information Literacy Model to Enhance English-Major Students' Critical Thinking Skills

<u>ส่วนที่ 1</u> แบบประเมินความเที่ยงตรงเชิงเนื้อหา (Content Validity)

สำหรับในการประเมินค่าดัชนีความสอดคล้องของข้อคำถามแต่ละข้อกับวัตถุประสงค์ (Index of Item – Objective Congruence: IOC) ผ่านเครื่องมือที่ท่านจะได้แสดงความคิดเห็นต่อไปนี้ เป็นเครื่องมือที่จะถูกใช้ในการวัดความสามารถด้านการคิดอย่างมีวิจารณญาณของผู้เรียนก่อนใช้รูปแบบการสอนการรู้สารสนเทศที่ผู้วิจัยได้สร้างขึ้น ซึ่งตอบวัตถุประสงค์ของงานวิจัยข้อที่ 3 ของการวิจัย (เพื่อทดสอบทักษะการคิดอย่างมีวิจารณญาณของผู้เรียนหลังการใช้รูปแบบการเรียนการสอนที่ได้พัฒนา)

ทั้งนี้ ผู้วิจัยได้แบ่งข้อคำถามออกเป็น 2 ประเภท ได้แก่ (1) คำถามเพื่อวัดทักษะการคิดอย่างมีวิจารณญาณการอ่าน และ (2) คำถามเพื่อวัดทักษะความสามารถในการประเมินสื่อ ก่อนและหลังเรียน โดยมีการแบบวัดทักษะการคิดอย่างมีวิจารณญาณการอ่านของผู้เรียนเป็น 3 ระดับ (จากระดับง่ายไปยาก) ตาม Bloom's Taxonomy ได้แก่ Analysis Asks, Interpretation Asks, และ Evaluation Asks รวมทั้งสิ้น 7 ข้อ และแบบวัดทักษะความสามารถในการประเมินสื่อ Information Literacy Asks จำนวน 3 ข้อ และเพื่อให้การวัดความสามารถด้านการคิดอย่างมีวิจารณญาณของผู้เรียนมีประสิทธิภาพสูงสุด คณะผู้วิจัยจึงได้ใช้ชุดคำถามเดียวกันกับเนื้อหาบทอ่านที่มีความคล้ายคลึงกันทั้งสิ้น 2 ชุด และทำให้ข้อคำถามมีความซ้ำซ้อนกัน ทั้งนี้เพื่อความสะดวกในการประเมินทางคณะผู้วิจัยได้แนบข้อคำถามเพียง 1 ชุดมายังการประเมินในครั้งนี้ดังแสดงในตารางดัชนี IOC ด้านล่างนี้

<u>คำแนะนำในการประเมิน</u>: ท่านสามารถเลือกแสดงข้อคิดเห็นโดยเลือก 1 ใน 3 ระดับดังนี้

1 แสดงว่าคำถามมีความสอดคล้องกับวัตถุประสงค์การวิจัย

0 แสดงว่าไม่แน่ใจว่าคำถามมีความ สอดคล้องกับวัตถุประสงค์การวิจัย และ

-1 แสดงว่าคำถามไม่มีความสอดคล้องกับวัตถุประสงค์การวิจัย

ข้อ	ข้อคำถาม	ข้อคิดเห็นผู้เชี่ยวชาญ			ข้อเสนอแนะ
		1	0	-1	
Objective: Analysis Asks					
1	What modes of analysis/ pattern of text organization are used (e.g. illustration, comparison/contrast, cause and effect, process analysis, classification/division, definition)?				
2	What is the overall main idea of the passages?				
Objective: Interpretation Asks					
3	What it the author's point of view toward the main idea of passage?				
4	Is the passage fact or opinion-based? Why?				
Objective: Evaluation Asks					
5	What can be concluded from the passage?				
6	Are the sources in passage reliable? Why or why not?				
7	Is the argument logically consistent? Convincing? Why or why not?				
Objective: Information Literacy Asks					
8	How could you evaluate the credibility of the research mentioned in the passage?				
9	If you want to explore more about the idea in the passage, where could you find reputable sources beyond this passage?				
10	If you were to choose incorporate information from this passage into a research project, would you choose this passage 1 to cite? Why or why not?				

<u>ส่วนที่ 2</u> แบบประเมินความเชื่อมั่นของแบบทดสอบ (Reliability of the pre and post-test)

<u>คำแนะนำในการประเมิน</u>: ท่านสามารถทำเครื่องหมายถูก (✓) หน้าข้อความที่เห็นด้วยกับความเชื่อมั่นของแบบทดสอบ

หัวข้อ	ข้อคำถาม	ข้อคิดเห็นผู้เชี่ยวชาญ	ข้อเสนอแนะ
1.	A test score is consistent in its conditions across two or more administrations		
2.	The test gives clear directions for scoring/evaluation		
3.	The test has uniform rubrics for scoring/evaluation		
4.	The test lends itself to consistent application of those rubrics by the scorer		
5.	The test contains items/tasks that are unambiguous to the test-taker		

MIL Model Student Satisfaction Survey

Instructions: Upon finishing the class, please rate 5 (Fully agree) to 1 (Fully disagree) with the statements provided in the table below

5 = Fully agree

4 = Agree

3 = Neither agree nor disagree

2 = Disagree

1 = Fully disagree

No.	Item	5	4	3	2	1
1	**Clarify and Share Intentions and Criteria**					
1.1	You feel that the objectives of the courses were clearly communicated to you					
1.2	You understand what was expected of you in terms of learning outcomes and assessment criteria					
2	**Engineer Effective Classroom Discussion**					
2.1	Your participation in classroom discussions is valuable					
2.2	You felt encouraged to share your ideas and opinions during class discussions					
2.3	You find these discussions engaging and relevant to the subject matter					
3	**Provide Feedback that Moves Learners Forward**					
3.1	You received timely and constructive feedback on your assignments and assessments					
3.2	The feedback helps you understand your strengths and areas for improvement					
4	**Activate Students as Owners of Their Learning**					
4.1	You feel that you had autonomy over your learning process					

No.	Item	5	4	3	2	1
4.2	You were able to set personal learning goals and engage in activities that matched your interests and learning style					
5	**Activate Students as Instructional Resources for One Another**					
5.1	You were always allowed to collaborate with your peers for group projects or study sessions					
5.2	You find these collaborative experiences beneficial in enhancing your understanding of the subjects					

Suggestions:

_____

_____

_____

Index of Item – Objective Congruence: IOC

MIL Model Student Satisfaction Survey

Expert name: _____

แบบประเมินความเที่ยงตรงเชิงเนื้อหา (Content Validity) ของแบบประเมินความพึงพอใจหลังการเรียนผ่านรูปแบบการเรียนที่ผู้วิจัยได้พัฒนา ภายใต้หัวข้องานวิจัย เรื่อง Development of Information Literacy Model to Enhance English-Major Students' Critical Thinking Skills

แบบประเมินความเที่ยงตรงเชิงเนื้อหา (Content Validity)

สำหรับในการประเมินค่าดัชนีความสอดคล้องของข้อคำถามแต่ละข้อกับวัตถุประสงค์ (Index of Item – Objective Congruence: IOC) ผ่านเครื่องมือที่ท่านจะได้แสดงความคิดเห็นต่อไปนี้ เป็นเครื่องมือที่จะถูกใช้ในการประเมินความพึงพอใจหลังการเรียนผ่านรูปแบบการสอนการรู้สารสนเทศที่ผู้วิจัยได้สร้างขึ้น ซึ่งตอบวัตถุประสงค์ของงานวิจัยข้อที่ 2 ของการวิจัย (เพื่อประเมินรูปแบบการสอนการรู้สาระสนเทศเพื่อส่งเสริมทักษะการคิดอย่างมีวิจารณญาณ)

ทั้งนี้ ผู้วิจัยได้แบ่งข้อคำถามในการประเมินความพึงพอใจออกเป็น 5 ประเภทโดยแบ่งตาม 5 Strategies of Meta-cognitive ซึ่งเป็นส่วนที่ผู้วิจัยได้เพิ่มเติมเข้าไปในกรอบแนวคิดของงานวิจัย ได้แก่ (1) Clarify and share intensions and criteria (2) Engineer effective classroom discussion (3) Provide feedback that moves learners forward (4) Activate students as owners of their learning (5) Activate students as instructional resources for one another เพื่อส่งเสริมทักษะการคิดอย่างมีวิจารณญาณของนักศึกษาวิชาเอกภาษาอังกฤษ ซึ่งผลการประเมินความพึงพอใจของผู้เรียนจะสะท้อนให้ผู้วิจัยเห็นว่าขั้นตอนต่าง ๆที่เพิ่มเข้าไปเพื่อเพิ่มพูนทักษะการคิดอย่างมีวิจารณญาณนั้นมีประสิทธิภาพมากน้อยเพียงใดในมุมมองของผู้เรียนหลังการใช้โมเดลที่ผู้วิจัยได้ผลิตขึ้น โดยผลจากการตอบแบบสอบถามนี้จะไม่ได้วัดทักษะการคิดวิเคราะห์ของผู้เรียนโดยตรง เนื่องจากทักษะดังกล่าวจะถูกวัดและประเมินผ่านแบบวัดก่อนและหลังการวิจัยที่ได้จัดทำขึ้นต่างหากและได้นำส่งให้ท่านประเมินไปก่อนหน้าเป็นที่เรียบร้อยแล้ว

<u>คำแนะนำในการประเมิน</u>: ท่านสามารถเลือกแสดงข้อคิดเห็นโดยเลือก 1 ใน 3 ระดับดังนี้

1 แสดงว่าคำถามมีความสอดคล้องกับวัตถุประสงค์การวิจัย

0 แสดงว่าไม่แน่ใจว่าคำถามมีความ สอดคล้องกับวัตถุประสงค์การวิจัย และ

-1 แสดงว่าคำถามไม่มีความสอดคล้องกับวัตถุประสงค์การวิจัย

Criteria

1.00 – 1.50 Fully disagree

1.51 – 2.50 Disagree

2.51 – 3.50 Neither agree nor disagree

3.51 – 4.50 Agree

4.51 – 5.00 Fully agree

ข้อ	ข้อคำถาม	ข้อคิดเห็นผู้เชี่ยวชาญ			ข้อเสนอแนะ
		1	0	-1	
Objective 1: Clarify and Share Intentions and Criteria					
1	You feel that the objectives of the courses were clearly communicated to you				
2	You understand what was expected of you in terms of learning outcomes and assessment criteria				
Objective 2: Engineer Effective Classroom Discussion					
3	Your participation in classroom discussions is valuable				
4	You felt encouraged to share your ideas and opinions during class discussions				
5	You find these discussions engaging and relevant to the subject matter				
Objective 3: Provide Feedback that Moves Learners Forward					
6	You received timely and constructive feedback on your assignments and assessments				
7	The feedback help you understand your strengths and areas for improvement				
Objective 4: Activate Students as Owners of Their Learning					
8	You feel that you had autonomy over your learning process				
9	You were able to set personal learning goals and engage in activities that matched your interests and learning style				
Objective 5: Activate Students as Instructional Resources for One Another					
10	You were always allowed to collaborate with your peers for group projects or study sessions				
11	You find these collaborative experiences beneficial in enhancing your understanding of the subjects				

Curriculum Vitae of the Researchers

Main Researcher:

1. **Name– Last Name** (Thai): นางสาวชนิดา พงศ์นภารักษ์

   (English) Ms. Chanida Phongnapharuk

2. **Current Position** Lecturer, School of Liberal Arts,
   Mae Fah Luang University

3. **Educational Background**

Degree Qualifications	Educational Institution/Year of Graduation
M. Ed. (English)	Chiang Mai University, 2007
B. Ed. (English)	Chiang Mai University, 2005

4. **Professional Background**

Years		Professional Background
From	To	
2008	Present	Lecturer, School of Liberal Arts, Mae Fah Luang University

5. **Specialization (different from the degree of education)**

   Digital Media Literacy, Technology Integration in Teaching English, English for Specific Purpose

Collaborating Researcher

1. **Name– Last Name** (Thai): ผู้ช่วยศาสตราจารย์เพียรศิลป์ ปินชัย

   (English) Assistant Professor Piansin Pinchai

2. **Current Position** Lecturer, School of Liberal Arts,
   Mae Fah Luang University

3. **Educational Background**

Degree Qualifications	**Educational Institution/Year of Graduation**
M. Ed. (English)	Chiang Mai University, 2012
BA. (English)	Mae Fah Luang University, 2009

4. **Professional Background**

Years		**Professional Background**
From	**To**	
2012	Present	Lecturer, School of Liberal Arts, Mae Fah Luang University

5. **Specialization (different from the degree of education)**
   Digital Media Literacy, Technology Integration in Teaching English, English for Specific Purpose

6. **Research publication, both domestically and internationally. Please specify the title of the work and the name of the journal according to international standards.**

เพียรศิลป์ ปินชัย. (2559). การใช้การเสริมต่อการเรียนรู้การเขียนเพื่อส่งเสริมความสามารถในการเขียนอนุเฉทของผู้เรียน.วารสารศึกษาศาสตร์ มหาวิทยาลัยทักษิณ, 16 (2), 43-51.